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THE POWER OF COMBINATION.

Peradeniya, July 15, 1913.

The inarticulate peasantry in all countries are conservative folk; "slow to believe in novelties; patient of much error in actualities; deeply and for ever certain of the greatness that is in Law, in Custom once solemnly established." Time is therefore required before customs can be altered and a new movement like that of co-operation can fructify. The mind being a very much more complex medium of fertility than the soil, sowing the seed of co-operation is not like sowing a crop of beans. We cannot forecast the time of harvest though the human mind being practical and therefore a fertile medium we are assured that the seed being good, harvest will eventually come. But like the goiya himself we must be patient. We cannot expect him to throw over customs followed for centuries, may be for thousands of years, for one he only heard of a few weeks ago.

Thus equipped we can look hopefully for the successful application of co-operative principles to the agricultural industries of Ceylon. We are sometimes asked why is it necessary to co-operate; cannot the Government come to the rescue of the goiya by direct methods? The answer to this is in the negative for reasons which are admirably explained in an article from the *Ceylon Poultry Magazine* we reproduce elsewhere. The goiya carries on business by a system of credit, paying interest at a rate which we may take to be in the main 100 per cent. per

annum. This is a crushing burden; and before we can ever hope to raise the status of the native cultivator and enable him to take advantage of improved methods of agriculture this burden must be removed. This can only be done by giving him access to the open money market, but Governments and banks are not in a position to ascertain the circumstances of every villager to make sure that his security is good. It is here where the system of co-operation steps in. The Government—or bank—can deal with a village but not with every villager. A village will not default though an occasional villager might. In order that they may become a responsible medium unit it is necessary of course for the members of a village or group of villages to combine and form themselves into a Society for registration.

Every villager can claim the right to become a member of the local society but yet for its own protection the society must possess the right of refusing membership to anyone likely to injure its cause and thereby that of the community as a whole. A small subscription is demanded of each member. This gives him the right of participation in privileges and advantages the society may possess. Without some payment, no matter how small, he could demand nothing. Hence we see the importance of each member being required to subscribe to the share capital.

Beyond this token of material substance it is not necessary that the candidate should possess any worldly goods whatever; not even so much as a hoe handle, though a thrifty subject will generally have accumulated around him some possessions. The only qualification is character. Villagers know the characters of their fellow villagers and a black sheep, one likely to let them down, they will exclude seeing that they are responsible for him. This is why it is necessary to provide that Societies shall only make advances to members.

It is obvious from the foregoing that Co-operative Societies will have in them great possibilities for influencing for good the character of the people. Membership of the local society will become the hall mark of respectability and each man will strive not only to qualify himself for membership but to commit no act that might lead to his expulsion. Societies will become the referees of disputes and thus influenced, authority and responsibility will gradually pass to the elected representatives of the villagers themselves.

R. N. L.

IMPERIAL INSTITUTE BULLETIN.

The first quarterly issue of the Imperial Institute Bulletin for the present year has reached us. Every issue of this Bulletin which is edited by the Director and prepared by the scientific and technical staff of the Imperial Institute and by other contributors contains interesting reading and useful information. The present number has, among others, an account of the Imperial Institute which was erected at South Kensington as the National Memorial of the Jubilee of the late Queen Victoria by whom it was opened in May 1893. The other articles are Tobacco from Portuguese East Africa; Tobacco from Papua; The Utilisation of Sudan Dura; Camphor oil and crude camphor from the Federated Malay States, etc. The following are the special articles: The Progress of Egyptian Agriculture, with special reference to Cotton by Mr. Gerald C. Dudgeon, F.E.S.; The Agriculture of Mozambique Province, Portuguese East Africa, by Mr. R. N. Lyne, F.L.S., lately Director of Agriculture in the province of Mozambique ; and The Pottery Industry of Ilorin, Northern Nigeria, by Dr. J. W. Scott Macfie. The Bulletin contains notes on some common spices while an account on the Manufacture of Paper Pulp for Export will also be found.

In other pages of this magazine will be found extracts from this issue of the Imperial Institute Bulletin dealing on certain products.

THE PLANTERS' ASSOCIATION OF MALAYA.

We are in receipt of the Chairman's Report to the Sixth Annual Meeting of the Planters' Association of Malaya which is interesting reading, rubber claiming of course first place. At the end of 1912 Malaya had 452,000 acres planted up with rubber. The output for the year 1912 amounted to 20,327 tons—an increase of 19,897 tons compared with that of six years ago; while the estimated production of the Peninsula for 1913 is given at 29,900 tons. It has not been possible to publish an accurate record of the area under coconuts the greater part being under native cultivation but the estimated approximate acreage is 156,000 acres. The market price of the coconut in towns is often as high as 9 cents. In the three years 1910-12, the export of tapioca from Malacca declined from 133,467 to 61,720 piculs the decline being due to the replacement of tapioca by rubber. Coffee, hitherto the chief European cultivation, is now only taken up by small Chinese planters or by Europeans as catch-crops. The F.M.S. exports of coffee for the three years 1910, 1911 and 1912 amounted to 32,688 piculs. Sugar is another product which has been replaced by rubber and the F.M.S. exports for the years 1910-12 reached 252,924 piculs while the figures for the Straits Settlements show a total of 2,429,936 for the same period.

POULTRY.

POULTRY COMPETITION IN NORFOLK.

Only three flocks of the 22 were mongrels and the breeds were of many kinds, including Plymouth Rocks, Wyandottes, Rhode Island Reds, Orpingtons, Leghorns and Minorcas.

At the conclusion of the contest, the competitors sent up their information to headquarters and a meeting for the purpose of encouraging improved measures of poultry keeping was held at the county town.

Table 1 gives a summary of the costs and profits of the individual flocks :—

TABLE I.

Number.	Breed.	Number of hens.	Grain per hen per month.	Cost per hen per month.	Eggs per hen per month.	Profit per hen per six months.
			lbs.	cents.		cents.
1	Plymouth Rock	50	7·5	9·0	11 7	67·74
2	do	39	6·3	7·5	13.2	93·3
3	do	52	6·3	7·7	8.0	32·6
4	do	49	5·4	8·0	10.5	59·0
5	do	70	5·9	5·4	4.1	4·54
6	Leghorn	95	4·9	8·2	16.6	135·1
7	do	85	5·3	7·1	12.9	87·9
8	do	58	5·1	6·0	10.0	57·8
9	do	126	4·2	7·5	10.9	66·0
10	do	90	5·7	5·5	7.2	33·1
11	do	87	5·0	5·1	8.3	46·6
12	do	85	5·6	5·7	10.1	64·1
13	Wyandotte	35	8	10·7	16.05	73·9
14	do	140	7·6	8·4	7.4	20·5
15	do	69	7·2	9·8	8.4	24·4
16	Cross bred	70	5·6	6·06	8.9	48·4
17	do	51	9	9.3	11.3	53·7
18	do	48	5·4	6·6	10.7	63·9
19	Orpington	114	5	7·4	8.3	47·5
20	Rhode Island Red	45	5·2	5·5	11.9	89·6
21	Minorca	70	7·8	9·0	10.0	41·4

The profit, i.e., the amount received for eggs above the cost of feed, for the six months from December, 1910 to May 31, 1911, averaged for all the 21 flocks 57·67 cents per hen, or 57·67 dollars per 100 hens. The best results ($1·97) were obtained by No. 6, the flock which won the competition.

Five of the competitors continued their records till December 1, 1911; the results are given in Table II.

TABLE II.

Number.	Breed.	Number of hens.	Grain per hen per year.	Cost per hen per year.	Eggs per hen per year.	Profit per hen per year.
			lbs.	cents.		cents.
1	Plymouth Rock	50	63·4	78.0	128·2	104
6	Leghorn	95	50·4	77.5	157·4	197
8	do	58	50·4	60.0	123·2	119
19	Orpington	114	49·5	70.0	85·5	85
20	Rhode Island Red	45	53.0	58.8	124·8	115

The writer further sought to discover the cause which determined the profitableness of the different flocks, and came to the conclusion that this is not to be found so much in the breed, as in the feeding and management of the fowls. The best results were obtained where the flocks were given buttermilk and green food, and where the fowl-house was well ventilated. Further figures are given in support of this view.—MONTHLY BULLETIN.

A FUNGUS DISEASE OF POULTRY.

According to an article which appears in the *Bulletin Agricole du Congo Belge*, for December 1912, a contagious disease known as thrush ('la teigne') causes very considerable loss among poultry in the Belgian Congo. The disease is due to a fungus parasite of the same family as *Trichophyton tonsurans*, which is the cause of a similar complaint in man and mammals.

The first symptoms appear on the comb and ears where white spots are produced marking the centres of mycelial development. These rapidly extend and finally unite to form large patches of yellowish-white scurf over the entire head. As the regions of the eyes and ears are attacked, the bird loses its sense of sight and hearing, and then quickly succumbs.

The disease is very contagious. It is therefore necessary to isolate affected subjects immediately. The diseased parts should be treated with a solution of perchloride of iron mixed with two to three times its weight of glycerine. According to another authority, a good remedy is to rub the affected parts with citric ointment or with mercuric ointment to which has been added a fifth part by weight of mercuric iodide.

The heads of birds that have died from the disease should be buried in lime or burnt.—AGRICULTURAL NEWS.

SOME POULTRY NOTES.

SELECTING A BREED.

Be sure that the male at the head of the flock is purebred.

The Mediterranean or egg breeds are: Leghorns, Minorcas, Spanish, Blue Andalusians and Anconas.

The American or general-purpose breeds are: Plymouth Rocks, Wyandottes, Javas, Dominiques, Rhode Island Reds and Buckeyes.

The Asiatic or meet breeds are: Brahmas, Cochins and Langshans.

The English breeds are: Dorkings, Orpingtons and Redcaps.

For farm use the American breeds are probably the best.

Purebred poultry means uniformity of products.

Uniformity of products means increased profits, if products are properly marketed.

Given the same care and feed, purebred fowls will make a greater profit than mongrels.

Subscribe for a good poultry paper.

Every poultry keeper should have a copy of the "American Standard of Perfection."

FEEDING.

In order to obtain eggs it is necessary to have healthy, vigorous stock properly fed.

Nature provides.	Scientific classification.	Poultrymen feed.
Worms and bugs	Nitrogenous material or ... protein.	Eggs, meat (green cut bone or beef scrap), milk, or cottage cheese.
Seeds ...	Non-nitrogenous ...	Wheat, oats, corn, barley, etc.,
Greens ...	Succulents ...	Lettuce, cabbage, kale, mangels, alfalfa, clover, sprouted oats, etc.
Grit ...	Mineral matter ...	Grit & oyster shell.
Water ...	Water ...	Water.

A splendid mixture for laying hens is equal parts of cracked corn, wheat, and oats, which should be scattered in the litter.

Bran or middlings and beef scraps should be kept in receptacles to which the fowls have access at all times.

Plenty of exercise increases the egg yield.

Provide 4 or 5 inches of good, clean litter in which to scatter the grain.

Cabbages, mangels, potatoes, sprouted oats, etc., make excellent green feed.

When wet mashes are fed, be sure they are crumbly and not sticky.

For the first three days chicks may be fed with a mixture of equal parts of hard-boiled eggs and stale bread, or stale bread soaked in milk. When bread and milk are used, care should be exercised to squeeze all milk out of the bread.

From the third or fourth day until the chicks can eat wheat or cracked corn, commercial chick feed is a good ration.

Plenty of pure, fresh water, grit, shell, and green feed should be available from the first day.

There is very little danger of overfeeding young stock.

Feed the chickens about five times daily and only what they will eat up clean in a few minutes, except at night, when they should receive all they want.

LICE AND MITES.

The free use of an effective lice powder is always in order.

A dust bath is very essential in ridding the fowls of lice.

In applying powder hold the fowl by the feet, head down, and work the powder well down into the feathers.

The free use of kerosene on the roosts and in the cracks will exterminate mites.

Whitewash is very effective against vermin.

COMMON DISEASES AND TREATMENT.

All diseased birds should be isolated.

Colds and roup.—Disinfect the drinking water as follows: To each gallon of water add the amount of potassium permanganate that will remain on the surface of a dime.

Canker.—Sprinkle a little flowers of sulphur in the mouth and throat of the bird, and put some chlorate of potash in the water. Also carefully remove the exudate with the aid of warm water and apply a 2 per cent. solution of creolin to the diseased tissue.

Chicken pox.—Apply a touch of iodin and carbolated vaseline to each sore.

Gapes.—New ground and vigorous cultivation will often remedy this trouble.

Scaly legs.—Apply vaseline containing 2 per cent. of creolin to the affected parts, and after 24 hours soak in warm soapy water. Repeat treatment until cured.

Diarrhoea in hens.—Low-grade wheat flour or middlings is good for this trouble. Also give teasponful of castor oil containing five drops of oil of turpentine to each fowl.

Bowel trouble in chicks.—Well-boiled rice mixed with a little charcoal will often check this complaint. Dissolve 15 grains of crude catechu in each gallon of drinking water.

RULES.

It is urged that all farmers and poultrymen adhere strictly to the following rules in handling their poultry and eggs:

1. Keep the nests clean; provide one nest for every four hens.
2. Gather the eggs twice daily.
3. Keep the eggs in a cool, dry room or cellar.
4. Market the eggs at least twice a week.
5. Sell, kill or confine all male birds as soon as the hatching season is over.—FARMERS' BULLETIN.

DEMAND FOR ENGLISH POULTRY IN SWITZERLAND.

The Commercial Intelligence Branch of the Board of Trade is informed that there is a demand in Switzerland for high-class English poultry. It appears that very few poultry are kept in that country, although the consumption of eggs and poultry is very great owing to the large number of visitors. As a consequence, great quantities of these commodities have to be imported, the better qualities mostly arriving from France and the inferior qualities from Italy. So far as the former are concerned, an increased demand has not been met by larger supplies. The season of greatest demand extends from July to October, the time when the birds are plentiful and prices are falling in the English market. Some trial shipments of Sussex chickens were sent to Switzerland last summer, and when the consignments arrived in good condition, the purchasers found they were superior to all others, and expressed a desire that more should be available. It was found however, that the method of killing adopted led to rapid deterioration in hot weather, and that, therefore, the exporters ran great risk of loss. It is advised that the fowls should be killed by "paletting," then finger drawn, and finally thoroughly cooked, as they would be from two to four days in transit; further, that the birds be graded, wrapped in parchment paper, and delivered to the shippers in London in cases each holding two or three dozen.—BOARD OF TRADE JOURNAL.

THE POULTRY TICK.

By D. F. LAURIE.

The poultry tick (*Argas persicus*, super family *Ixodoidea*, family *Argasidæ*) was, according to the writer, D. F. LAURIE, introduced into South Australia from India and does much harm in the former country, being the means of transmitting *Spirochaeta marchouxi* (the causative agent of tick fever). Good results against tick fever have been obtained with salvarsan, but the only radical cure, in the opinion of the writer, is the eradication of the tick. To this end Mr. Laurie has tried various measures and he finds that a 5 or 10 per cent. kerosene emulsion is the best remedy. The ticks are destroyed by one minute's immersion in this liquid; for practical purposes the spraying, and even soaking, of poultry houses with this emulsion has proved efficacious. Old timber containing many cracks, which serve as shelters to the ticks, should not be used for poultry houses.—MONTHLY BULLETIN

EGG-LAYING AT THE HAWKESBURY AGRICULTURAL COLLEGE.

The conspicuous feature is the establishment of a new world's record for first-year laying, states the *Agricultural Gazette* of N. S. W. The previous record for six birds was 1,589 eggs by a pen of White Leghorns at the Roseworthy Agricultural College (South Australia) competition in 1911-2. This has been eclipsed by Mr. F. Morison's pen of Indian Runner ducks, which put out 1,601 eggs, notwithstanding that the first egg was not laid until April 12. As the eggs averaged 31 oz. per dozen, the six ducks laid no less than 258 lb. weight of eggs. The net market value of the eggs was £8 11s. 2d. The following is the daily record of the laying of this pen :—

April :	0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 4 1 2 3 4 6 6 6 6 6 ...	53
May :	6 4 5 3 5 4 5 4 3 6 6 6 5 6 6 6 4 3 4 4 3 4 4 6 5 6 4 6 4 6 6 ...	149
June :	6 6 6 6 6 6 5 5 6 6 5 5 6 6 5 5 5 5 5 6 6 5 5 6 6 6 6 6 6 4 ...	167
July :	4 2 4 3 2 3 5 4 4 3 3 6 6 6 6 6 6 6 5 4 6 6 5 6 4 6 6 6 4 6 6 ...	149
August :	3 4 4 3 5 4 6 5 4 4 5 6 5 6 4 6 6 6 5 6 5 6 5 4 4 4 5 5 5 5 5	150
September :	5 4 3 5 5 4 5 5 6 4 4 5 5 5 6 5 6 6 4 6 5 6 6 6 6 6 6 6 6 5	156
October :	3 3 6 3 6 6 5 6 5 5 5 5 4 5 4 4 5 6 4 5 3 6 6 4 5 5 5 4 3 4 6	148
November :	4 5 6 5 4 5 6 5 4 5 2 6 5 5 5 5 6 5 4 5 4 4 3 6 4 5 5 6 5 6	145
December :	6 6 6 6 6 5 5 6 6 5 5 6 6 6 5 5 5 4 3 2 4 5 4 6 4 5 5 5 4 4 6	156
January :	4 4 6 6 6 5 4 5 5 4 4 5 4 4 4 4 4 6 4 4 6 4 4 2 3 4 3 3 4 5 5	135
February :	5 5 5 4 3 4 4 3 2 4 4 4 4 6 4 3 5 3 4 2 3 3 2 5 2 3 2 2 ...	100
March :	2 2 2 3 1 4 3 4 3 3 3 3 5 3 3 3 3 3 2 4 3 5 2 3 3 2 4 2 4 3 3	93

As these birds did not commence to lay till 12th April, 1912, they were kept at the College till 11th April, 1913, to complete the full twelve months. The laying for this period was as follows :

2 2 4 2 3 3 2 3 3 3 3

making a grand total of 1,631 eggs.

FEEDING CHICKS.

Three hens set at the same time on eggs taken at random and all set near each other so that they all had the same conditions and with all the hens behaving well on the nest, not sticking too closely, not staying off too long, still gave variable results. One hatched 11 out of 13, one 4 out of 11, and another 4 out of 9. One Turkey hen hatched 16 out of 17 another set beside it, and 9 out of 16 but she behaved badly, leaving her nest at times and crowding in beside the other one.

To secure fertility of eggs the cocks have to be healthy and active and the hens so too.

When the chickens hatch, if the hen is quiet and does not want to leave her nest because two or three chickens are half a day to a day before the others, let her alone. If she makes to step off with one or two chicks as sometimes happen, take the little ones away and put them in a box of cotton wool in a warm place; but do not attempt to feed them. As soon as all the chickens are hatched put the others back. It is exceptional however for this to be necessary. When eggs are fresh they all hatch out within twelve hours and an ordinary hen will not leave the nest until she sees some of the chickens moving about, making to pick up.

Of all the feeds available here for starting off young chickens well, we have found none so useful as coarse Scotch oatmeal. Chickens do not require to begin feeding until they are at least twenty-four hours hatched and then only if they are particularly strong and lively; it is better they should not be fed until they are thirty-six hours hatched and forty-eight hours will not be too long. To attempt to get them to feed under twenty-four hours old, means, if they pick up food, indigestion for them to start off with. If any eggs remain unhatched, and in testing them are found clear and good, these can be boiled and crumbled very fine through the coarse oatmeal. Let the chickens have water as they please. Brown rice boiled so that every grain is clean not made sticky, can be alternated with the oatmeal. After a week if chickens are considered valuable and worth pushing on, small scraps of meat, fat and even gristle with the meat, can be cut very fine and given them. And ticks from the cows are valuable food as they of course contain blood. If labourers are forking or hoeing land give one of them an empty salmon tin and ask him to pick up any worms he comes across and drop them in the tin. No food pushes on chickens like worms. Then after a fortnight the nest of duck ants may be sought for and a piece taken off for the chickens every day. Guinea corn if it would only be extensively grown, would be one of the very best foods for fowls and chickens, as the grains are small enough to be fed to the latter. One of the difficulties in poultry rearing is to be able to feed a large number of chickens separately from the fowls; because the chickens want to be fed oftener than hens and their food is finer and more expensive, while it does them harm to pick up whole corn meant for hens. And it does not pay for the hens to be crowding in and taking the food meant for chickens while the latter go without, it always pays to have one or two fenced runs, where chickens can be kept and fed separately if necessary. Also this enables some of the best hens with a good cock to be kept apart to supply eggs for setting instead of taking these at random from a crowd of hens, sometimes from the poorest layers.

The coarse oatmeal can be dropped after a month as it is more costly than crushed corn which can be safely fed after that but should be alternated with a little brown rice (not white rice). The rice is better soaked first in water as it swells so much. Chickens should be fed four times a day, a little at a

time for the first month, then three times a day until they are grown. Plenty of clean water should always be provided.

LICE AND TICKS.

A useful ointment for all kinds of Parasites on Poultry.

Lard	...	¼	tablespoonfuls.
Sulphur	...	1	,,
Kerosene	...	1	,,

If a little of this is rubbed on the back of the head, the rump, and beneath the wings it will destroy all kinds of lice and ticks on fowls. Rubbed on the legs of fowls suffering from scaly legs it will cure this unsightly trouble.

FOWL TICKS.

Fowl ticks are an increasing pest, and when fowls are attacked by them for the first time, they are thrown into a high fever, in the same way as imported cows are, when tick bitten for the first time. But not only that, the fowl loses the power of its legs, as in cramp, and in bad cases also loses the power of its neck; in fact the birds seem nearly paralyzed.

We sent specimens of the fowl ticks to Professor Nuttall, of Cambridge, England, some time ago, who reported that the ticks are *Argas persicus* the same as occur elsewhere and that he was not able to produce on fowls there the conditions described by us. It may be, however, that the fowls he used had already been infected mildly.

To cure an attack, as described, first kill the ticks on the fowl with the sulphur and lard paste ; give twice a day one-twentieth of the ordinary dose of quinine, sold everywhere now for one farthing. Feed on bread soaked in milk. Rub the joints and the back at the junction of the neck, with a good embrocation.—JOURNAL OF THE BOARD OF AGRICULTURE.

TOBACCO.

GROWTH OF TOBACCO IN IRELAND.

In 1911 twenty growers planted the crop, the amount produced being 134,486 lb. on 119½ acres. The average yield was 1,125 lb. per acre, the highest yet obtained except that for 1908, which was 1,200 lb. per acre. The following table shows the cost of production and the returns for each class of tobacco grown:—

Kind of Tobacco.	Pipe (average of 6 centres).	Cigarette (one centre).	Cigar (one centre).	Pipe and cigarette (one centre).
Average yield per acre in lb.	1,074	1,543	520	1,496
Cost of production per lb.	6. 9d.	11. 3d.	22. 4d.	4. 8d.
Amount received per lb.	5. 2d.	6. 0d.	7 1d.	5. 5d.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Cost of production, per acre.	31 1 4	72 11 6	48 18 8	30 3 6
Amount received, per acre.	23 1 10	38 11 5	15 7 9	33 12 3

The quantity of tobacco produced and the gross return per acre in 1911 showed a marked incre se at all centres over the results of the previous two years. This improvement was due to the very favourable season and, in some cases, also to the more extensive use of home-saved seed. The cost of production must vary somewhat with the weight of the crop, and should also be affected by the weather, which in 1911 rather facilitated most operations. Taking these facts into consideration, the results do not indicate any marked economies in the cost of production in 1911.—JOUR. OF THE BOARD OF AGRIC.

TOBACCO IN HUNGARY.

Experiments begun in 1897 by the writer, Director of the Royal Hungarian Experiment Station for Tobacco Cultivation at Debreczen, in 8 plots of sandy soil to which from this date no manure was applied for 13 successive years, in order that the effect of the manures subsequently spread on the exhausted soil might be studied.

The yield of the tobacco grown during this time diminished in quantity and deteriorated more and more every year. While during the first few years the crop of "Szeged" varied from 1850 lb. to 2,000 lb. per acre, in 1909 it was only 960 lb. The analysis of the soil showed that, during these 13 years, the loss of nitrogen and lime had been greater than that of potash or phosphates.

Finally in 1910, the application of chemical manures began. Owing to the special nature of the experiments, a larger quantity of manure than usual was used per acre, viz. 390 lb. of 18 per cent. superphosphate, the same amount of 40 per cent. potash and 530 lb. of nitrate of soda; the two first were applied at the beginning of February and the last in two parts after the first and the second hoeing. When, as in 1910, the rainfall is abundant, a satisfactory result can be confidently expected.

The following table gives the distribution of the various manures, the yields, and the combustibility of the tobacco before and after fermentation :—

Plots.	Manures.	Amount of manure per acre.	Yield per acre.	Excess over control.	Combustibility of leaves per second.	
					Before fermentation.	After fermentation.
		lbs.	lbs.	lbs.	seconds	second
1	Control (no manure for the 13 preceding years)	—	998	—	23	31
2	Farmyard manure	46,350	1,485	487	18	23
3	18 % superphosphate	390	1,044	46	21	36
4	40 % potash salts	390	1,176	178	29	42
5	Nitrate of soda	530	1,632	634	16	27
6	18 % superphosphate 40 % potash salts	390 390	1,300	302	32	48
7	18 % superphosphate 40 % potash salts Nitrate of soda	390 390 530	1,795	797	22	34
8	18 % superphosphate 40 % potash salts Nitrate of soda Lime from sugar factories	390 390 530 15,400	2,110	1,112	21	29

The conclusions reached are:

The tobacco grown on the control plot showed a very feeble condition of development; its thin light-green leaves, 8 on a stem, manifested the characteristic signs of want of nitrogen. It was deficiency in nitrogen that had reduced the yield; this was clearly seen from the plants which had been given nitrate of soda, whose much larger, thick dark green leaves, 12 on the stem, developed normally, while superphosphate and potash, whether used together or separately, had only a secondary effect on increasing the crop. In fact, the excess of plot 6 over the control was 302 lb. while that of plot 7 was 797 lb. The fertilizing effect of the lime used with the superphosphate, potash and nitrate (plot 8) should also be noticed; this was shown by a yield superior to that obtained from any other plot. This effect is explained by the impoverishment of the experiment soil during the period of 13 years, when the lime content decreased from 0.207 per cent. to 0'112 per cent.

It was further shown that, thanks to the application of nitrate, a more valuable and resistant substance was obtained, and though the combustibility of the leaves was less than when other manures were employed, yet a fine ash was obtained.

The Experiment Station will continue its experiments; every three years a mixture of farmyard manure and lime will be applied, other manures being added every year, with the view of observing the effects due to the application of an excessive amount of manures during a prolonged period of time.—MONTHLY BULLETIN.

TOBACCO CULTURE IN BRITISH EAST AFRICA.

By C. J. MONSON.

The past season has been somewhat disappointing. The large rains followed by months of dull weather, caused the leaf to remain much greener than would have been the case had it ripened and mellowed in the sun's rays in the field. Heavy storms also did considerable damage, and in the Njoro and Lower Molo districts hail storms to a great extent spoilt the crops. The cold wet weather in the former of these districts stopped plant growth and caused the yield of leaf to be small in size and poor in quality.

The experiments, carried out by the Department on the Government Farm at Kabete, shew that the red Kikuyu soil is more suitable for the dark varieties of tobacco than the yellow. The results of these experiments, of course, only apply to the culture of tobacco on this class of soil. In other districts such as Kibwezi, Mua the Lower Molo and parts of the Uasin Gishu Plateau, where sandy loams are to be found, it is confidently expected that a good type of yellow leaf will be produced. Samples of the tobacco cured at Kabete will be sent to the Imperial Institute for report on burning qualities, flavour, and suitability of the leaf for the Home market, and further experiments will be continued at Kabete with those varieties of tobacco which

the experience of the past season would tend to point out as suitable for culture in the district. It is proposed to erect an air-curing barn of simple and inexpensive construction for the curing of those tobaccos.

In this connection, the results of experiments at Potchefstroom, as reported in the Agricultural Journal of the Union of South Africa, are of great interest. The soil on which this crop was grown is a brown loam, about twelve inches deep, with a sub-soil of ironstone, gravel and shale. It was originally poor in plant food, but has been brought to a good state of fertility by applications of farm-yard and phosphatic manures. The plots were about ¼ acre in size. The varieties of tobacco grown were: Sterling and Clarksville. The plants were set out in a field, four feet between the rows and three feet in the rows, on November 21st, and were harvested in April. The leaf was air cured. The following figures represent the prices actually realized for the crop grown, and the yield per acre is calculated from the whole crop grown.

	Sterling.	Clarksville.
Actual yield of ·27 acre ...	503 lbs.	407 lbs.
Yield per acre	1,864 ,,	1,508 ,,

Prices realized :—

(a) First quality ...	202 lbs.	@	1/-	200 lb.	@	8d.
(b) Second quality	202 ,,	,,	9d.	193 ,,	,,	3d.
Total value of crop per acre	£65-9-0			£33-14-0.		

AGRICULTURAL JOURNAL OF BR. EAST AFRICA.

RUBBER.

RUBBER EXHIBITION OF JUNE 1914.

The Committee of the Rubber Growers' Association have decided to offer the following trophies for the Rubber Exhibition, to be held in London, June 1914:—

1. That the Rubber Growers' Association Medals be offered for the best commercial samples of Plantation Rubber exhibited in the following classes:—

Class 1.	Crepe
Class 2.	Smoked Sheet
Class 3.	Assorted invoice, embracing No. 1 Rubber and Scrap Grades.

NOTE. Samples entered for competition to be wharf-drawn samples, in each case representative of a break or invoice of not less than 50 cases of Rubber, and such samples must be certified by the Wharfingers as having been drawn within three months of the opening of the Exhibition. The awards to be given on the judgment of the Standard Qualities Committee of the Rubber Trade Association of London.

2. That a Gold Medal be given by the R.G.A. for the best exhibit connected with Plantation Rubber grown in the Middle East, to be awarded by Judges to be appointed by the R.G.A.
3. A prize of £ 50 and a Gold Medal to be given by the R.G.A. for what is adjudged to be the most valuable improvement connected with the Collection or Preparation of Plantation Rubber (open only to Managers or Assistants on Estates), such improvement to have been introduced between the 1st July, 1913, and the 31st March, 1914, at which latter date all claims must have been lodged with the R.G.A. in London.

   These awards to be given by Judges to be appointed by the R.G.A.
4. That the R.G.A. Gold, Silver and Bronze Medals be given for the three best exhibits of Rubber-flooring in Tile or Sheet form—open to manufacturers of any country.
5. That the R.G.A. Gold Medal be given for the exhibit composed of the greatest variety of articles made from Rubber for commercial and domestic purposes.—Open to manufacturers of any country.
6. That a prize of £ 50 and a Gold Medal be given for the discovery and application of such new use for Plantation Rubber as may be adjudged the most valuable; special consideration being given to the weight of the rubber which such application is likely to consume.

Mr. Henry C. Pearson of America is offering a Thousand Dollar Silver Cup for the best means of extracting the latex from the wild trees of the Hevea, Manihot and Castilloa species; by the best means he implies one that is relatively of the greatest value. This is important to Brazil, Mexico and Plantations of the East, and other rubber countries of the world. In all, trophies to the value of £1,500 are being presented for competition for the better production of the crude rubber, and also several trophies for the manufacturing section.

FOURTH INTERNATIONAL RUBBER EXHIBITION.

The authorities have issued a first edition of the prospectus of this great Exhibition which is fixed for June, 1914 in London. With the rubber display will be associated cotton, fibres and other tropical products, so that the result should be a more or less complete tropical planting exposition.

The exhibition will remain open from the 24th June, to the 9th July, during which time the International Congress of Tropical Agriculture will also be sitting.

A section is to be devoted to Palms and Palm Products and this should prove one of the most interesting displays.

The available space for the exhibition covers an area of over 200,000 square feet.

THE VITALITY OF HEVEA SEEDS.

By E. DE WILDEMAN.

After having given a summary of the experiments of Mr. F. G. Spring, Superintendent of the plantations of the Federated Malay States on the vitality and germinating property of Hevea seeds the writer makes the following observations, says the *Monthly Bulletin*.

According to Mr. Spring's experiments, of which the results are reproduced in the tables given later, it appears that 50 per cent.more of the seeds of untapped than of tapped Hevea trees germinate. It is an interesting fact that these experiments, while reversing the conclusions reached in 1908 in the *Circulars and Agricultural Journal of the Royal Botanic Gardens, Ceylon*, confirm the statement that the seeds of untapped trees are, on an average, 10·7 per cent. heavier than those of tapped trees of the same age.

To preserve the germinating property of Hevea seeds various methods of covering them have been used; Mr. Spring has made experiments as to their relative efficiency. The results show that the highest germination percentage is obtained by using either seeds from untapped Para Rubber trees, or seeds from tapped trees, which have been enveloped in wax.

The writer of this article states that the necessity of knowing beforehand the value of the plants to be raised, and the need for regulating selection, are reasons for preferring the seed of tapped trees, while Mr. Spring's experiments show the value of covering the seeds with wax. This is, however, costly; but if the seeds have to be subjected to a journey, of over 45 days, the number of plants obtained from seeds thus treated will repay the expense incurred.

On the other hand, the experiments on the germinating property of seeds of tapped Hevea should be continued, to determine whether the germination percentage diminishes with the number of years tapping has been continued. Should this prove to be the case, which is probable, seed for sowing purposes should be selected from trees which have been seldom tapped, but yet often enough to afford some criterion of their economic value. Thus there remain to be made a number of experiments, whose results will be of great importance to the future of the plantations.

The following tables give the results of Mr. Spring's experiments:

I. Germination percentage of seeds from tapped and untapped trees.

	Number of seeds per box.	Duration of experiment.	Number of plants from seed from trees.		Percentage of germinated seeds of trees.	
			tapped.	untapped.	tapped.	untapped.
1	200	3 weeks.	67	156	33	78
2	200	5 ,,	46	133	23	66
3	200	7 ,,	48	100	24	50
4	200	8 ,,	40	167	20	83
5	200	9 ,,	40	164	20	82
6	200	10 ,,	40	165	20	82

II. Germination percentage of seeds of tapped "Hevea" trees untreated and enveloped in wax and in paraffin.

	Number of seeds per box.	Duration of experiment.	Number of plants obtained.		Germination percentage.		
			wax.	paraffin.	wax.	paraffin.	untreated.
1	180	3 weeks.	107	62	59	34	33
2	180	5 ,,	108	71	60	40	23
3	180	7 ,,	94	74	52	41	24
4	180	8 ,,	82	66	45	37	20
5	180	9 ,,	100	61	55	34	20
6	180	10 ,,	86	58	47	32	20

TAPPING A FIRST RUBBER TREE.

Mr. R. K. Hardwick the Manager of Membakut Estate deserves all the praise he has undoubtedly received for the manner in which he has conducted the Estate since he went there. Planting began in November, 1909, and on 6th April, 1913, little more than three years later, a tree 26¾ inches in girth 3 feet from the ground, and that not the the largest tree on the estate, was tapped with due ceremony and celebration by the Hon'ble Mr. E. H. Barraut, Resident of the West Coast. There are at present 10,000 trees with a girth of 16 inches and more ready for the knife and in 6 months' time a further 10,000 trees will be ready for tapping. Can any estate in Ceylon or the Malay States claim a finer record of growth than that ?

A temporary factory and smoke house have been built sufficient to deal with the present output. A permanent factory is in course of construction and will be ready next year.—THE BR. NORTH BORNEO HERALD.

PLANTING PARA RUBBER ON HILL SIDES.

By L. C. BROWN.

In planting Para Rubber on the side of hills where the gradients are severe, I believe it would prove of great advantage to adopt the same method as that practised in Penang with Nutmegs and Cloves on similar situations.

The system is simple enough. As soon as the young plants or stumps have been put out, a circle of about 3 feet in diameter is made round them and the earth taken from the upper half of this to the lower so as to form the circle into a terrace. At each weeding after this, more earth should be taken from above the plant and the circle enlarged and weeded. If this be done constantly as the coolies come round at the regular weeding periods it will be found that by the time the trees have reached maturity these circles practically form a series of terraces on the sides of the hills, according to the distances the trees are apart.

It will be noticed that the plants are all along being fed with the rich surface soil which alone should assist their growth and for the same reason the circles or terraces round the trees are easily weeded and kept clean as the top surface soil remains loose and friable for a considerable time. Apart from the entire eradication of lalang, no other weeding on the clearing is required and the timber and grass will prevent heavy wash and quite do away with the necessity of drainage, of course the timber and stumps should ultimately all be removed and destroyed. The next benefit derived is when the tapping stage commences ; for instead of the tappers having the difficulty of climbing slopes in an irregular way, they each take a circle or circles as the case may be, the walking being practically all on the level, and under these conditions the coolies should be able to tap the same, or if not very nearly the same number of trees as on the flat.

Considering the saving of expense that can be effected in the directions I have mentioned, the system should not be unduly costly, and I think on the other hand it must be admitted it has many advantages over the method now usually adopted. I may in conclusion mention that this method of cultivation must be commenced while the plants are quite young, otherwise taking the earth from above the trees when once thoroughly established would mean the lateral roots being interfered with and exposed.—AGRIC: BULLETIN OF THE F. M. S.

THE DIAGNOSIS OF TRUE HEVEA BRASILIENSIS.

By F. A. STOCKDALE, M.A., F.L.S.

MR. F. A. STOCKDALE, till lately Assistant Director of Science and Agriculture, made a careful investigation of the varieties of rubber trees cultivated on certain estates in British Guiana; and the following notes on the varieties of *Hevea brasiliensis* and of *H. confusa* have considerable interest in view of the doubts that have hitherto surrounded the subject.

"The leaves of *H. brasiliensis* vary considerably in shape. Some trees possess leaves that are typically lanceolate whilst others are much broader. Often trees in favoured situations making very vigorous growth produce very large leaves which are broader in comparison with their length than are the typical leaves. Not infrequently two or more types of leaves are to be found on the same trees. The under-surface of *H. brasiliensis* leaves in the young stage are either slightly purplish or greyish-purple in colour, but this colour disappears as the leaves become older. The petiolar apical glands of *H. brasiliensis* are either three or four in number but sometimes two are to be found. When two only are present, they are generally close together and not widely separated as in *H. confusa* and other indigenous species. The very young leaves of *H. brasiliensis* hang vertically downwards, unless distorted by wind.

BARK VARIATIONS IN H. BRASILIENSIS.

"The bark of *H. brasiliensis* varies. As recorded in 1910, at least two (distinguished by external appearances) types of barks exist in 12 year old trees of *H. brasiliensis* growing in the colony—the one a corky bark showing longitudinal markings and the other a perfectly smooth greyish-white bark showing no warts or markings. These barks on being tapped show marked differences—the former being thick and of a reddish-brown colour when freshly cut and yielding a good return of latex, while the latter is thin, of a greenish-white colour when cut, and yields little or no latex. It was then also observed that the trees showing these differences in barks also exhibited differences in habit of growth, and it was recommended to cut out the smooth-barked kind as it was a very poor latex yielder and might produce seeds or

cross-fertilize with the better, rougher, longitudinally-marked kind. Subsequent examination of younger plants growing under varying conditions of soil and climate revealed that there was another type of *Hevea brasiliensis* that differed in the external appearance of the bark. This kind showed a sparsely warted or prickly appearance. These small "warts" or "prickles" were near the ground-level of the stem, often arranged more or less longitudinally, and existed on the stems to a height of about three feet above the level of the ground. Above this the stems were smooth. The yield of the latex from such a kind of *H. brasiliensis* could not be ascertained as the trees had not reached tappable size, but it was noticed that generally this type was not quite as vigorous in its growth as was the rough longitudinally-marked type.

CEYLON TYPES.

"Mr. Kelway Bamber, of Ceylon, in a paper read at the Rubber Exhibition, London, 1911, recorded that in Ceylon there were at least three types of *H. brasiliensis* trees differing in their barks. Two of these, he stated, yielded latex satisfactorily, while the third—which had a thin, smooth, greyish-coloured bark—gave practically no latex. When tapping experiments were commenced in June last, at the Issorora Experiment Station, North Western District, (B.G.) careful notes were made of the different kinds of barks found. At least three could be distinguished by external appearances, but it is possible that these may again be subdivided into other groups on account of internal differences. It was noticed that the croky, longitudinally-marked variety always possessed a thicker bark than the other sorts, was more easy to tap and seemed to yield relatively the largest returns of latex. This is the kind that would, from our present knowledge, be recommended for planting purposes if seed selection were possible.

CONFUSA HYBRIDS.

With regard to certain plants raised from seeds obtained from Trinidad, Mr. Stockdale reports:

"There in no doubt that these plants have been raised from seeds obtained from hybrid *brasiliensis* and *confusa* plants. There were quite a number of different forms of leaves and barks, but I was able to pick out, even in my hurried inspection, several plants that were typically *confusa*. The barks of such plants are darker in colour and are covered with warts placed very close together. The leaflets are of a lighter green in colour than *brasiliensis*, glossy, very coriaceous in texture, broader nearer the shoulder than across the middle of the blade, venation closer than in *brasiliensis*. The petiolar glands are generally two in number set far apart and are of a different shape than are the glands of *brasiliensis*. The petioles are generally purple or greenish purple in colour. The latex of *confusa* is always yellow.

Specimens from a large number of seedling plants in the Nursery of a plantation in the colony, which judged by the above-mentioned characteristics, were considered by the technical officers of the Department not to be typical *Hevea brasiliensis* but probably hybrids of *H. confusa* and *H. brasiliensis* were recently forwarded to the authorities of the Royal Botanic Gardens, Kew, for critical and authoritative examination. The following are extracts from the report of the Assistant Director of Kew (Mr. A. W. Hill, M.A., F.L.S.):—

"We find ourselves in complete agreement with Mr. Stockdale's conclusions . . . . , those grown in the nursery at Pln . . . . . (Specimen No. 8,886) are either from examples of *H. confusa* or hybrids between *H. confusa* and *H. brasiliensis*."—JOUR. OF THE BOARD OF AGRI., BRITISH GUIANA.

A GIANT HEVEA.

In the Acre territory, it is said, there is a specimen of the Hevea Brasiliensis which measures 25 ft. in circumference. This tree holds the record in the Amazon Valley, both for size and yield. It is reported to give a revenue of about £432 a year, and is the sole support of a family of seven but this is probably an exaggeration, as with rubber at 3s. a lb. £432 a year represents an output of nearly 3,000 lb.—a tall order! The Rubber Defence superintendent has ordered it to be photographed with the family assembled beneath it.—The Rubber World.

WILD AND CEARA RUBBER IN EAST AFRICA.

A colonial report on the East Africa Protectorate for 1911-12 states that the exports of rubber amounted in value to about £16,500. The progressive expansion in the exports of rubber which was reported in previous years has received a temporary check, for whereas in 1910-11 the value exported reached the unprecedented total of £31,963, in 1911-12 this figure decreased by 48 per cent. to £16,498, inclusive of £2,686 for plantation rubber. The diminution in quantity is from 1,726 cwt. to 1,207 cwt., or 30 per cent., inclusive of 193 cwt. for plantation rubber. The export of wild rubber is declining, while many of the plantation trees have not yet come into bearing. The decrease is stated to be principally due to the temporary prohibition of cutting the wild vine. Tapping of Ceara trees has, however, been carried out on several properties, and the yield of latex obtained was good, the prepared rubber being sold at good prices. New Ceara plantations are said to be coming into yielding yearly, while a further large area has been put under Manihot and Glaziovii at the coast and Kibwezi.—The Rubber World.

CO-OPERATIVE CREDIT.

CO-OPERATIVE CREDIT ASSOCIATIONS IN THE UNITED KINGDOM.

At the end of 1911 there were at work 223 co-operative credit associations, with an aggregate membership of 22,054 as compared with 81 associations and 6,014 members in 1901. In 1911, 45 of these associations with 4,088 members were in England (of which 18 with 3,364 members were urban); one (urban) association with 354 members was in Scotland; and 177 associations (all rural) with 17,612 members were in Ireland.

The amount of loans advanced to members in 1911 was £79,808, and the amount repaid, including interest, £77,623, and each of these figures is about four times as large as the corresponding figure for 1901. The total capital of the associations was £168,274, and the amount owing by borrowers £117,439.

The associations are usually managed by unpaid officials, and the expenses are therefore kept small. Thus the total working expenses, including interest on capital, of the whole of the 223 associations was only £7,919 in 1911. The aggregate net profit made by all the associations was £302.—BOARD OF TRADE LABOUR GAZETTE.

LOCAL CREDIT SOCIETIES.

The importance to which agricultural co-operative credit has attained in Germany is shown by the record of the work of the local credit societies in 1910. The total number of such societies in existence in that year was 16,735; they had a working capital of £135,000,000, of which £120,000,000, were members' deposits; at the end of the year the loans on current account were £23,000,000, and for fixed periods £60,000,000; the total amount of the loans granted in 1910 were £34,000,000 on current account, and £15,000,000 for fixed periods. Many of these local credit societies undertake the purchase of farm requisites for their members, the purchases in 1910 amounting to£4,300,000.—JOURNAL OF THE BOARD OF AGRICULTURE.

AGRICULTURAL CREDIT BANKS.

THEIR POSSIBILITIES AND THEIR USES.

One of the chief questions connected with Ceylon Agriculture at present being that of Co-operative Credit, the account reproduced below from the Ceylon Poultry Club Magazine on the possibilities and uses of Agricultural Credit Banks by Mr. R. T. Lang, J. P. will be read with interest.

When Mr. Walter Runciman was appointed to the Presidency of the Board of Agriculture there were scoffers galore. "What can he know of

agriculture?" said the pundits. How could he follow such an expert as Lord Carrington? Having had unique opportunities of observing Mr. Runciman's work I have no hesitation in declaring him the best President of the Board of Agriculture we have ever had. I say this with no detriment to Lord Carrington, whose splendid work for agriculture men of all political thought recognise. Lord Carrington laid the foundation. Mr. Runciman is building the structure.

The most epoch-making step in the agricultural career of the President was that declared on the afternoon of Tuesday, January 14th. It was in reply to an apparently simple question by Mr. Hamersley that Mr. Runciman unfolded a scheme which means salvation to thousands of our small farmers and particularly of that class amongst whom it is most desirable to develop the poultry industry. The details have been already spread broadcast. I need not repeat them in full. I propose instead to deal with some of the more salient points.

Before dealing with Mr. Runciman's plans I would like to say a word on the need which has risen for credit banks. My experience of rural life has shown me that there has come a great change over rural finance in recent years. The development of the joint stock bank has been the cause. Thirty or forty years ago private banks were supreme. They were managed locally. The head of the bank knew all his customers personally. A customer who wanted an advance could approach the head direct. If the agriculturist were a man of good repute he had little difficulty in obtaining an advance on what would be considered to-day intangible security. I know of one instance of an agriculturist who, at one time, was indebted to his bankers to the tune of £12,000 without a penny of security. The banker knew his man and his business. To-day that man's cheque for £50, 000 would be honoured in a moment. He built his fortune on the combination of his own credit and the bank's cash. The private banker would advance on growing crops.

The advent of Joint-stock banks has put an end to all this. Requests for advances have to be forwarded to headquarters. The Board (usually in London) knowing nothing of the private status of the proposed borrower demands collateral security. That is a difficulty to the working farmer. If he cannot provide it, one of two things happens. Either he goes to a money-lender or an auctioneer. I don't know which is the worse of the two. The money-lender will bleed every penny out of him eventually. The auctioneer may or may not. I know some auctioneers who act splendidly by their men. I know instances where they serve as the private bankers. But there are others. Let me give one instance which came directly under my own eye.

A poultry-keeper in a large way found himself running short of cash. He was financially sound, but his money was locked up in stock. So he went to an auctioneer for an advance and got it readily; but the time came for repayment. The farmer could not repay without heavy sacrifices. His stock wasn't ready, so the auctioneer agreed to an extension of time provided the farmer would agree to a quantity of stock being put on his farm and fed free. It was a rate of interest far beyond the sixty-per-cent. of the money lender. This is not an isolated instance. I can give others following similar lines. While many auctioneers act nobly by their people—there are

others. And the law, as it has stood, has been on the side of the others. Mr Runciman has followed the right lines in calling in the co-operation of the joint-stock banks. He proposes that we should have agricultural credit societies on the lines of those which have proved so successful in Normandy, Denmark and Russia. The fundamental feature of these credit societies is mutual credit. Every member is personally responsible for the debts of the whole society. I can hear it argued at once: why should I be responsible for my neighbour's debts? My friend, you need not be. You are not compelled to join one of these societies. But unless you are endowed with superabundant wealth you will find that it is to your advantage to enrol yourself.

The basic principle of such societies is that no man is admitted to membership unless he is known to be of good repute. Let us take any village community as an example. In that community are a number of farmers, stock breeders, poultry-keepers and agriculturists in general who are all known to one another. Probably amongst them are one or two black sheep. It is decided to form a credit society. The black sheep will be promptly excluded. Other men will not accept responsibility for them. But the men who have attained a decent reputation for paying their debts will band themselves together for mutual assistance and support. A small, confidential committee will be appointed. It must be a confidential committee. The man who desires to borrow money doesn't want everyone to know about it. The committee will consider the security offered; if it be on stock, say poultry, the committee as practical men will decide whether it offers a reasonable margin of security. Moreover, they will consider the reputation of the proposed borrower. Is he an honourable man? If he is, and the security is sound, then the society will jointly guarantee to the bank the advance which the bank is to make. When the stock is sold, the committee, with its local knowledge, will see that the advance is repaid. Local knowledge is the keystone of it all.

The principle of joint liability is that which has worked so well in the friendly societies. In these, every member is personally liable for the whole debts of the society. But by means of careful management the personal liability is reduced to a minimum. Practically it is non-existent. So will it be in the agricultural credit societies.

The rate of interest must be low. With such a guarantee the banks can afford to advance at slightly over what we know as "bank rates." Think what it means to be able to borrow money for stock purposes at five per cent. per annum, instead of the money-lender's five per cent. per month. All advances must be sternly restricted to requirements in stock, cultivation or buildings.

Non-members should be allowed to subscribe to the funds. There are many people in the country who would be willing to help by subscriptions of £100 and upwards. They could join us as non-members, receiving a small interest on the money they invest. But only full members should be eligible for loans.

One suggestion only have I to make. It is that the Government should assist in the formation of these societies (at any rate, in their early stages) by advances commensurate with the amount of members' subscriptions. The money of the Development Commissioners would be much better laid out in this direction than in building new roads for motorists. For all such money laid out is productive to the country. It encourages enterprise. It builds up the land industry.

COTTON AND HEMP.

NEW ZEALAND FLAX.

The New Zealand Hemp, or Flax Lily, as it is sometimes called, is known botanically as *Phormium tenax* and belongs to the natural order *Liliaceæ*. It is a native of New Zealand, occurring also in Norfolk Island and Lord Howe's Island, and has been introduced into most temperate and sub-tropical countries. In the tropics, however, it is not so well-known as it deserves to be, for it is a useful as well as an ornamental plant, and is worth growing in gardens or odd corners on up-country estates in the tropics, being suited to elevations of 5,000 to 6,000 feet. The plant has long been established in Hakgala Gardens, Ceylon, where the photograph for the accompanying block was taken. Here the plant has become quite acclimatized, flowering and fruiting freely and forming a conspicuous object in the ornamental borders and shrubberies. A bushy perennial with a fibrous root-stock, it usually attains a height of about seven to eight feet, though as much as fifteen feet in height has been recorded for the plant in its native home. The long rigid sword-shaped leaves are either green throughout or streaked and margined with white, giving the plant a decorative effect ; consequently it is often grown in Europe and other cool countries as an ornamental greenhouse plant, and may at present be seen retailed in some London nurseries at 3s. to 5s. per plant.

From an utilitarian point of view, as has already been mentioned, the plant is not to be despised, for it yields from the leaves a valuable commercial fibre which, "carefully prepared can be spun into durable textile fabrics, either by itself or mixed with cotton, wool or flax." From the finer qualities of the fibre the Maories weave elegant articles of wearing apparel, and the coarser kinds can be made into ropes, cordage and paper. According to Baron von Muëller the fibre is free from gum resin, and when properly dressed withstands moisture as well as the best Manila rope. Its present price (May 1913) is £30 to £33 per ton in London. The New Zealand Government have offered £12,000 in prizes for the discovery of improvements in connection with (1) the extraction and dressing of the fibre or (2) the utilisation of the by-products obtained during the process of extracting the fibre. The competition is open till the end of this year.

Properly prepared the fibre is of a silky lustre and nearly white in colour ; the yield is estimated at the rate of about 2 to 2¼ tons of clean fibre per acre, and in the proportion of over 5 per cent. of the green leaves. Torn into strips longitudinally the leaves afford a useful tying material, especially convenient for such purposes as tying up plants to supports, or packages of plants, vegetables, etc., for transport.

The plant is readily propagated by division of the root-stock or by sowing the seed ; it thrives in any ordinarily good soil, and prefers a moist situation, as on the banks of a pond or river. The richer the soil the more vigorous the growth of the plant and as a rule the better the fibre. Several

varieties occur of both the green and variegated forms. Baron von Muëller refers to the three most distinct varieties in New Zealand as the Tehore, Swamp and the Hill variety. The first and last mentioned produce a fine, soft, but strong fibre, while the Swamp variety yields a coarser fibre.

H. F. MacMillan.

Photo. by H. Macmillan.

NEW ZEALAND FLAX. (Phormium tenax.)

COTTON EXPERIMENTS IN THE CAPE PROVINCE.

Attempts at growing cotton have been made in various parts of the Cape Province, but the absence of any system of experiment and the want of the necessary supervision have made the results practically useless. A large portion of the Cape Province is not suited to the growing of this crop, and it was resolved to test the suitability of a certain area where the conditions of labour, soil, climate and rainfall seemed to indicate the best chances of success. The site chosen was at the Big Umgazi, in the District of Port St. John's, Pondoland. The soil consists of a rich, dark, heavy sandy loam, and was moderately moist at planting time.

Ten pounds of seed was used per acre. The land was only ploughed up once, namely just before planting, and harrowed. A shower of rain (about 0·35 in.) fell the evening after planting. Plants were thinned out

when 14 days old and again at one month. The perennial varieties—that is the Sea Island and Egyptian—were planted from 5 ft. to 7 ft. apart in the rows. The rows of the rest were 4 ft. apart. The annexed table shows the results obtained:—

Date of Planting.	Variety planted.	Height of Plant.		No. of Bolls to plant.		No. of Bolls to lb. of Seed Cotton.		Percentage of Stand.	Size of Plot.	Yield per acre
		Selected.	Average.	Selected.	As found.	Selected.	As found.			
1911.		in.	in.					%	acres.	
October 28	Sea Island	102	78	188	150	89	112	99	5	1 369·8
,, 29	Egyptian Mitafifi	102	78	222	99	98	119	94	3	1 285·6
,, 29	American Toole	60	51	130	71	66	75	80	2	2 067·5
,, 30	Nyasaland Upland	72	60	168	97	68	73	52	3½	1 548·2
,, 30	Cleveland Big Boll	54	48	59	39	43	52	100	½	1 010·0
,, 30	Herlong	48	45	57	34	—	—	100	½	810·0

The Sea Island and Egyptian varieties grew out almost too luxuriantly, so that the sun was excluded to a great extent and only about half of the bolls ripened. The annuals also grew out well and gave very satisfactory yields.

Weather conditions were favourable during planting time, but a protracted period of drought set in when plants were about six weeks old. The crop was freely cultivated and a certain amount of hand-hoeing was also done to keep the field clear of weeds.—MONTHLY BULLETIN.

COTTON CULTIVATION IN TRANS-CAUCASUS.

Cotton has been cultivated in Trans-Caucasus for a long time. Under Persian rule the country produced a coarse native variety for which there was no market abroad, but which was largely used locally. A change took place soon after Trans-Caucasus was incorporated in the Russian Empire. Until then the obstacle to cotton cultivation by the peasants was that selling prices of the product were too low. Cereals, on the other hand, which yielded excellent crops, were grown to such an extent that eventually producers found difficulty in disposing of their grain even at low prices. Attention was thus again turned to cotton cultivation and numerous attempts were made to improve the quality of the fibre. The introduction of American seed and American methods gave such satisfactory results that in 1894 the limitation of cotton cultivation was prescribed, owing to cereals being neglected and the price of wheat becoming very high. In 1911 the cultivation of cotton in Trans-Caucasus occupied an area of 100,000 deciatines (109,200 hectares) and the crop was estimated at 5 million pounds (about 81,900,000 kilos). —CHAMBER OF COMMERCE JOURNAL.

THE LANCASHIRE COTTON INDUSTRY.

It may be said that during the past ten years the cotton industry has advanced at a greater rate than at any period of its history. The cause of this progress is due to many circumstances, all of which have been associated with the trade, more or less, since the beginning of the industrial revolution, hastened by mechanical inventions, in the latter half of the eighteenth century. The humidity of the Lancashire atmosphere is particularly well suited to cotton spinning and weaving. Lancashire still maintains the lead in the construction of machinery for the cotton industry. The trade is highly specialised in all its branches. The controllers and workers have proceeded from parents to children through each generation of its history, the strength of the former having been kept up by the increasing directive ability of the operative classes. By birth and training, by regularity of labour and trade union organisation, the workers are the best spinners and weavers in the world. Generally, whole families are engaged in the industry, either in preparatory processes or in spinning and weaving, or in the making of textile machinery. Their whole time is devoted to textile work, and that condition has prevailed in Lancashire now for over one hundred years. All this, of course, has given to Great Britain her chief cause in the continual advance of the trade—that is, the production of superior yarns and cloth. No country can yet approach Great Britain in her command of the world's markets for cotton manufacturers. As already stated about 82 per cent. of the output of her 850,000 looms goes abroad. As compared with other countries she depends chiefly on the production of mule yarn, mules being more adapted for the spinning of fine yarns. Of the 55,164,794 spinning spindles, only about 10,000,000 of them are ring spindles, and the majority of these have been erected since 1904. Germany, for instance, is about equally divided in the possession of mule and ring spindles, there being 5,193,212 of the one and 5,142,062 of the other. Most other manufacturing countries are in a similar position as regards the division of spindles. In the United States of America the cotton-spinning industry is chiefly of ring frames: her spindles are approximately 25,000,000 ring and 5,000,000 mule. Of the 20,000,000 spindles throughout the world engaged in the consumption of the finest grades of cotton, viz., Egyptian and Sea Island, 15,000,000 are in Great Britain. Likewise, British spindles are more employed in spinning the finer grades of American cotton than other countries are.

Among other advantages which Great Britain possesses is that of the cheaper cost of mill building. The cost of erection of spinning mills is estimated at 25*s*. per spindle; in Germany it is 37*s*., in America 50*s*., in France 35*s*. Also owing to the superiority of workers and organisation in English mills a less number of hands are required per spindle. Dr. Schulze-Gaevernitz, a German investigator, produces several examples of this. In one instance he takes a typical mill in Oldham (England) and one in Mulhouse (Germany). The complete figures of each mill show that the percentage of operatives per 1,000 spindles in Oldham was 2·4 and 5·8 in Mulhouse. In Switzerland the percentage on 40's twist was 6·2, whilst in Oldham it was only 2·3.—INDIAN TRADE JOURNAL.

LONG STAPLE UPLAND COTTON FOR THE TROPICS.

The following extracts are from an article written by Howard Newport, Instructor in Tropical Agriculture, to the *Queensland Agricultural Journal*:—

The question as to whether Sea Island or Upland types of cotton are best suited to Queensland has been much debated by those interested and, so far as cotton culture has found favour at all in this State, it would seem that Sea Island varieties have, on the whole, been found the best in the coastal agricultural belts of the North, while the Uplands are the principal varieties considered in the more Southern parts.

The case for the two types may roughly be stated as follows:—The Sea Island is usually a perennial, bearing better crops in its second and third seasons than in its first, and is a long staple obtaining 25 per cent. to 50 per cent. better prices than normal Upland cotton. Varieties of this type are sometimes called Tree cottons, and, as a rule, the bushes are larger and taller than the Upland, and will stand a heavier rainfall. This type may be recognised by the dash of magenta or light red colouring in the petals of the flower, by a more deeply indented or incised leaf, and the clean skin or absence of "fuzz" on the seed.

The Upland types are usually annual, though sometimes showing perennial tendencies in the tropics, and have generally a short staple and a correspondingly lower value. The bush is smaller as a rule, and more can be grown to the acre. It is supposed to be better suited to drier situations and poorer soils. The type may be recognised by the wooliness of fuzz on the seed, by a less incised leaf, and the absence of any colouring at the base of the petal.

Between these types there are, of course, many variations and hybrids, for the cottons, like the hibiscus, to which they are nearly allied, naturally hybridise very readily.

In cultivation, also roughly, the Sea Island, while it will grow and thrive in wetter localities than Upland, must have a well-defined dry season for ripening its crop and for harvesting. The higher value obtained by its longer staple and its perennial habit does not necessarily constitute such an overwhelming advantage, however. While in North Queensland also it does best nearer the coast, in the richer soils, and where the rainfall is more continuous and heavy, the so-called advantage of its not requiring annual replanting or resowing is, to a large extent, set off by its tendency, under these conditions, to run to wood and leaf at times when the dry season happens to be shorter or not so clearly defined as usual; by a considerable risk of damage by storms, especially wind; by a protracted harvesting season; by the inevitable growth of weeds engendered by its permanent occupancy of the field rendering its cleaning difficult at all times and the cost heavy in view of the high price of labour in these parts; and last, but not least, a grave possibility of the perpetuation of pests and diseases for the same reason,

The Upland, on the other hand, in cultivation, needs a drier locality and poorer soil, and, though a smaller bush, is found to be quicker maturing, ripening its bolls more uniformly, and to be therefore more easily and cheaply picked. In favourable localities for growing Upland cotton there is less risk of loss by storms or wet weather during harvest. The returns per acre very nearly, if not quite, equal the longer-stapled Sea Island cottons in quantity, though not in quality or price. As a field crop it admits of a cleaning up annually, and may be ploughed out immediately after the crop is off, and the field fallowed for a few months before the resowing for the next season's crop. This involves the destruction of the old bushes and, with them, any pests that may have made their appearance during the season ; it allows for better and more thorough tilth, and at the same time is easier, more satisfactorily and cheaply kept clean than the periodic weeding and hoeing necessary for the permanent or perennial Sea Island types can do.

Given suitable climate conditions, therefore, while the Upland cotton crop may be of less intrinsic value, its cost of production is often less, and the production of profit quite as great as that of a field of Sea Island cotton.

The obtaining of the climatic conditions, or, inversely, the selection of the type of cotton suited to given climatic conditions, is a factor of far greater importance in the successful cultivation of this staple than would appear to have been recognised here as yet. These two types are by no means interchangeable at pleasure on most selections or farms; though the selection of the wrong type has in some instances, without doubt, been one at least of the principal causes of want of success, and in which cases success would be induced by such a change.

In this vast country there are hundreds of acres of land of all kinds and classes with equally divergent climatic conditions, and greater attention to the adaptation of suitable types to the climatic and soil conditions found to exist on a given selection, or where the staple is already determined upon, the more careful selection of suitable sites for plantations, would go far towards producing those individual successes so necessary here for the establishment of any new staple industry. It cannot be taken for granted that because maize can be grown, any species of cotton crop must, therefore, necessarily be a success.

COTTON IN NORTH QUEENSLAND.

In Northern Queensland it would seem more likely that cotton culture might be established as an industry in the drier portions of the plateau, and that probably with the shorter-lived but more easily and cheaply cultivated and produced Upland types.

Wherever cotton culture is established as a staple industry, scientific investigation has not been idle both in the improvement of methods of culture, in harvesting, and in the improvement of varieties. Among the Sea Island types the search for more reliable cropping varieties has, however, not met with as great success perhaps as the search for, or efforts to evolve by hybridization, a long-stapled species among the Upland types. Numerous trials have been carried out in the United States which have shown that new varieties of Upland cottons are to be found that are adapted to the tropics,

These varieties, so far, would seem to retain the characteristic preferences of the Upland types for dry conditions, though irrigation has been found feasible and beneficial in increasing the length and quality of the staple. This may be taken to imply that, possibly, these varieties will thrive somewhat nearer the coast, or at least under a rainfall heavier than that essential for the normal Uplands, though probably still necessitating a very clearly defined dry period.

Allen's Improved Long-staple Upland Cotton and a variety named the Sunflower are mentioned as some of the most satisfactory results of such trials; and now another variety, called the "Durango," is spoken of by Mr. O. F. Cook. Of this it is said in the "Tropical Agriculturist" for October, 1912:—"The variety called Durango is said to be superior to the old long staples. It is described as early and prolific, and producing larger bolls than Allen and Sunflower. The lint, if not as long, is more abundant and uniform in length—about 1¼ in. under favourable conditions. Other advantages stated are that the bulk of the crop could be gathered at one picking, and that the plant is decidedly drought-resisting. With the soil of the right texture and a supply of moisture through irrigation, it has been found possible to grow long-staple cottons such as this variety in a dry atmosphere. Too free irrigation is to be deprecated, and, given good tilth and a wet season for the germinating of the seed, it is found better to resort to irrigation only to protect the maturing crop against injury by too severe drought."

In Uganda the following results are available of trials with the two former cottons:—Allen's Improved Long-staple Upland Cotton there yielded over 1,000 lb. of seed cotton to the acre with an out-turn of 30·6 per cent. lint, which was reported on as being clean, lustrous, soft, cream-coloured, and free from stains, of excellent quality and good lustre, a fine, long, silky staple of fair strength that varied in length from 1·1 to 1·8 in., averaging between 1·4 and 1·6 in. It was valued at 9¼d. to 9½d. ginned, when middling American was 5·93d. Taking the lower figure, this gives us a return of about £12 worth of lint per acre.

Figures for the Sunflower variety are not given, this being dismissed with the short statement that it was also tried, but found not so good.

Neither the Sunflower nor Durango, so far as I am aware, have yet come to North Queensland; but Allen's Improved has, and some very interesting experiments have been carried out at the Gossypium Park Estate by its director, Mr. Joseph Campbell, M.A.

Seed was received by Mr. Campbell from the British Cotton Growers' Association through Mr. H. Crankshaw, of Letchworth, Herts, England, and was sown at Gossypium Park, Kamma, near Cairns, in August, 1911. Unfortunately, 1911 was a very dry season (the latter part of it), and anything but a favourable one for cotton; also, the planting on this occasion (owing to the late arrival of the seed) was rather out of season. The new variety was not found to be drought-resisting under these conditions, though it might prove more so if sown earlier in the year. Possibly for the same reason, it proved a shy bearer in this experiment, producing only at the

rate of some 200 lb. per acre. The out-turn, however, was most promising and indeed higher than has been as yet recorded, I believe—viz., 35 per cent. of clean lint of excellent quality. This is very considerably above the average for Upland cottons here.

As already stated this experiment was an out-of-season one, it being necessary to germinate the seed when received for fear of its losing its vitality if kept till the next year. Better results are anticipated in the matter of growth and returns with the acclimatised seed now obtained, and by more seasonable sowings, which the good out-turn obtained more than warrants. Mr. Campbell, therefore, is following up the experiment with his own new seed by sowing another plot this month (February) for a harvesting in September next, the results of which will be awaited with interest.

THE CULTIVATION OF CAMBODIA COTTON IN MADRAS.

By H. C. SAMPSON.

Cambodia cotton was first grown in the extreme south of the Presidency, i.e., in the Tinnevelly and Ramnad districts. On its first introduction, it was tried on black cotton soil as a dry crop in the same way that country cotton is grown. It was soon found that this was not nearly such a certain crop as the ordinary country cotton. Though in very favourable seasons i.e., in seasons with a well distributed rainfall with rain at regular intervals—it gave a heavier crop than the indigenous cotton, it was found that such seasons were few and far between and that in the long run the country cotton paid better. Then it was that it was tried with the aid of irrigation. Some farmers near Virudupatti who were growing it on shallow black soil (Veppal) which could be commanded by a well, gave the crop an irrigation with a view to save the total failure of the crop. The cotton improved so much under this treatment that a further irrigation was given with the result that the crop gave a very heavy yield. The next year every one who could obtain seed was growing Cambodia cotton on land commanded by irrigation. Other people who had no wells tried it on dry rainfed land, but quickly gave it up again. Thus within a very short time, Cambodia cotton became an established crop to be grown with the aid of irrigation. Since then, the fame of this cotton has gradually spread northwards through Madura, Ramnad, Trichinopoly and Coimbatore, and as it spreads one sees people learning the same lesson by experience, viz., that Cambodia, if it is to pay well, must be grown on land which can be irrigated. One always sees farmers, where this is a new crop, trying their luck with this as a rainfed crop, but one always sees that they do not try it again unless in the first year they had by chance an exceptionally good season.

The three lessons which farmers in some places have already learnt and which others can learn now without having to learn by experience are :—

(1) Do not grow Cambodia cotton on land which you cannot irrigate.

(2) Do not keep the crop in the land after the ordinary picking season is over. It does not pay and it harbours insect pests which spoil your cotton crops the next year.

(3) It pays to grow Cambodia cotton as an absolutely pure crop, even though the dealers may themselves mix it after they have ginned it.

Attention to the advice given above will be of great value not only to the individual farmer, but to the cotton grower in general. Dirty, immature and mixed cotton, which is the result of not paying attention to the lessons mentioned above, has the effect of generally lowering the market price. Spinning mills speak very highly of pure Cambodia when obtained from a well-grown crop. They object strongly however to the stained lint which is so commonly seen in the late pickings or in any unhealthy crop. They object also strongly to the weak fibre which adheres to immature seeds. Here again this is largely due to the unhealthy condition of the crop attracting those insects which suck out the juice from the young seed and prevent it from maturing. Finally they object strongly to a mixture of Cambodia and country cotton, specially when making yarn for dyeing since these two varieties of cotton do not take up the dye evenly.—THE MADRAS AGRIC: CALENDAR.

OSTRICH FARMING.

THE INDUSTRY IN AMERICA.

All the large ranches are irrigated from a main ditch running through the property, so that provision may be made for supplying water to the feeding paddocks which are alongside, and also in order that ample water may be provided in the run and feeding paddocks for the birds' drinking purposes, and to allow of their bathing when they so desire.

The feeding paddocks, or "corrals" as they are invariably called in America, are arranged side by side along the main ditch, and each run paddock has five or six feeding paddocks attached to it.

These feeding paddocks are from 6 to 10 acres in extent, according to the area of the run paddock to which they are attached, the idea being to have the total area of the feeding paddocks for each run paddock about one-third of the size of the run paddock ; thus if there are six 10-acre feeding paddocks attached to one run paddock, or a total area in feeding paddocks of 60 acres, the run paddock will be about 180 acres. On some of the ranches the whole of the run paddocks are used as combined run and feeding paddocks, but the best results are secured from having separate run and feeding paddocks, although there should be some kind of strong-growing perennial grass planted in all the run paddocks.

The feeding paddocks are only made available one or two at a time They are planted with various leguminous plants, such as alfala (lucerne), clovers, field-peas, or cowpeas; while some are kept for cereals, such as barley, oats, wheat, and millets of various kinds ; the idea being to have some kind of green feed all the year round.

Lucerne is the main stand-by among the legumes, and barley and the millets among the cereals for winter and summer feed respectively. The run paddocks are sown with some kind of hardy perennial grass that will grow without much irrigation. If irrigated, this portion of the land is only as a rule subjected to what is called "wild flooding."

All the paddocks that are irrigated are allowed to dry well before the birds are allowed in, as the ostrich does not thrive with wet feet.

The men looking after the birds see that their water supply is kept up, collect the eggs and any loose feathers lying around daily, look after and at once isolate any birds showing signs of sickness, and so on.

When any of the birds are fit to be plucked the mob containing them is driven to the plucking crushes. As each bird is to be dealt with, a bag, in the form of a large stocking, is put over its head, when it at once submits to any operation that is necessary to denude it of its valuable feathers, which are invariably clipped, although the operation is called "plucking."

The idea in the minds of many people that ostriches "mate" for life has been quite exploded on these large ranches. If two birds of opposite sexes are kept together for any length of time they will form a sort of attachment, but let either one out among the flock on the ranch and they at once take a freer view of their duties in this respect.

The greater number of birds in the Arizona ostrich farms are of South African stock and type, but it has been recently demonstrated that an infusion of Nubian or Red-necked blood has increased, not only the physical stamina of the birds, but also their capacity for producing valuable feathers.

The ostrich breeder has always to contend against the possibility of a proportion of his young birds reverting to the wild type, and thus, while, perhaps, producing an equal weight of feathers per year, producing them of an inferior quality as far as the greater proportion is concerned.

Although the birds having the most valuable feathers are the ones utilised for breeding, still there seems a tendency in the progeny to get back to a more mediocre type.

Experts say that this is largely because the breeding of ostriches in captivity on scientific principles has not yet extended over a sufficient number of generations to fix the improvements that have undoubtedly been made in their feather-producing capacity by careful selection. In this regard there is yet great work to be done by those who thoroughly understand the art of type-fixing in animals.

In selecting breeding birds, too often are the males only carefully selected, while the inferior females are less carefully culled out. In this way, too, much reliance is placed upon the power of the male animal to reproduce his kind from inferior females, and while the resulting birds are usually better than their inferior maternal parent, it takes many generations to get the inferior points of the progeny brought up to even a fair standard.

To breed first-class ostriches a good type of female bird is more important than a good male type, and this is especially so at present owing to the types, even in the best males, not having yet become permanently fixed.

All the eggs proposed to be used for hatching are first carefully selected and numbered or marked according to parentage, and after this is completed their numbers are again reduced by excluding all but the largest and most correctly formed ; the rejected eggs are sold to those who work them up into ornamental or useful articles.

The ostriches are all kept in mobs or flocks, according to age and ability to agree. Those of similar age have often to be divided into several small flocks because of their fighting propensities, and their general practice of worrying the weaker members. It often happens that birds of a previous season, or of the earlier breeds of the same season, have to be put back, according to their size and general physical condition, among younger companions ; while particularly aggressive, specially developed, or quarrelsome young birds have often to be paddocked with their seniors to reduce them to a reasonable state of conduct.

The feathers, when taken from the birds, are roughly classed by girls, and are tied in bundles weighing from about ½ lb. to 1 lb., and are sent direct to New York, to be made into the feathers of commerce.

The eggs are hatched in incubators, and the young are thus never in the care of their parents. They are kept in what is called the "chicken-run," and are specially cared for until old enough to be put out to "shift" for themselves in the large ranch paddocks.

The ostriches are valued, not from the point of view of general appearance, or from their productivity in feathers, but from their producing power of the higher grades of feathers, the inefficient in this regard being constantly weeded out, and too often sold to the inexperienced inaugurators of new ostrich farms.

Good birds require no more food or attention than mediocre or inferior ones, and as there is a tremendous difference between the annual returns from the best birds and even the second grades, it is more important to keep only the best in this class of farm stock than it is in any other. The ostrich has only one use—feather production—while any other class of farmbred stock has alternative uses to which it may be put; and this makes it all important from the point of view of those entering the industry that they should rigidly exclude from their early purchases all but the very best birds obtainable.

The ostrich lives to a great age—for longer than any other class of farmbred stock—so, if a good start is made, and the farm managed with reasonable intelligence, the flocks are a practically permanent source of income, and the yearly increase when the farm is fully stocked may all be sold.—AGRICULTURAL GAZETTE OF N. S. W.

EXPLOSIVES IN AGRICULTURE.

Dynamite or other explosives—and for the sake of brevity let me say "right here," that every time I use the word dynamite, I mean to infer "or other explosive if more suitable"—can be used with advantage in agricultural industries for the following reasons:-

1. To break up hard or virgin soil to facilitate ploughing; and especially to break up the under-crust, when present, which no plough could penetrate, at any rate no plough used by the average farmer or planter.

2. To blast out for removal, boulders, or rocks, and especially tree stumps, whereby not only is the risk of root disease removed, but what is of great importance, the ground is left in a state to be easily and properly ploughed; which otherwise would be impossible in a satisfactory manner, if the stumps or rocks are left *in situ*.

3. For clearing the soil of pests, destroying ants' nests, or rabbit warrens, etc. etc., as well as for regenerating and aerating hard or worn-out soils generally—as the sugar-lands on some of the West Indian estates which are not ploughed, but only hoed; i.e., the surface only scratched over, but the hard pan sub-soil is left year after year, and so becomes water-logged and airless; hence dangerous.

4. For throwing up the soil for drains, especially deep gullies, and facilitating its removal by ploughs or hand.

5. For making holes for tree-planting, and at the same time loosening the soil, which is a great advantage; also for fence-post holes, or for setting uprights for buildings, etc., in position.

6. For well-boring, or well-torpedoing—i.e., for increasing the flow from an artesian well by exploding a charge at the bottom of a well, to widen the aperture, and break up the ground, to let further supplies of water (or oil, if an oil-well) come through.

As time goes on, many other uses on the estates will no doubt be found, but as I do not pretend to have an exhaustive knowledge on the subject, I think I have said enough. Of course, I do not pretend to touch on the use of explosives for mining, since I speak only from the agriculturist's point of view; nor even of their utility for removing large masses of rock or soil for making estate roads, as the latter, although not uncommon, is too big and dangerous a task for the average planter, and should not be carried out without consulting an expert, one of whom now-a-days is to be found at all large centres, especially in the neighbourhood of mines.

"It must not be thought that dynamite obviates the necessity of top ploughing," very truly points out the *Queensland Agricultural Journal*. "Far from it. The plough must be used just as much as ever. The only difference is that the dynamite expends its disintegrating force in the sub-soil, which is never touched by the plough, so that one is not merely

planting the crops in the same soil year after year," but can, by its use enable the crops to draw up their nutriment from below. Where clay sub-soils form a water seal, the use of explosives, if correctly applied, breaks up the clay strata and so allows the accumulated and stagnant water to pass through (at the same time the explosion kills myriads of harmful lives), and dissolving the plant foods in the lower, and hitherto inaccessible strata, liberates it in such form that it can be drawn up by capillary attraction, and pass through with the now non-stagnant water to be assimilated by the crops. May I remind you here—as I reminded the readers of my book on "Coco-nuts" —of the need of regular, adequate supplies of water at all times, if you want good crops. Water is necessary, and therefore should constantly be at the disposal of the crops (provided, of course, if not in over supply), to convey the plant's food in soluble form up to the crown. The quantity of such food assimilated or digested by the plant is roughly proportional to the amount of water which it absorbs—provided, of course, that the food is there to be absorbed; but the food alone is no use; without the water it cannot pass up the trees or plants and nourish them.—Mr. HAMEL SMITH IN THE INDIA RUBBER JOURNAL.

COST OF SUBSOILING WITH EXPLOSIVES.

The extract given below is from an article contributed by H. C. Coggins to the *Agricultural Gazette of N.S.W.*:—

The following table will give some idea of the cost of subsoiling with explosives. I do not include labour, as this will depend on the rate paid and also on the strength of the ground. Where conditions are easy, a hole a minute should be done; but where the hard pan is tough and the subsoil very compact, it may take five minutes. Preparing the charges and tamping the holes will take nearly 4 minutes per hole.

Table showing Cost of Subsoiling with Explosives.

Distance of holes apart.	Charge.	Number of holes per acre.	Number of lb. per acre.	Number of feet of fuse per acre in 3 ft. holes.	Number of detonators per acre.	Total cost per acre.
Feet	Plug.					£. s. d.
10	½	435	21¾	1,305	435	2 12 9
10	1	435	43½	1,305	435	3 14 6
12	½	302	15	906	302	1 16 6
12	1	302	30	906	302	2 11 6
15	½	194	10	582	194	1 3 10
15	1	194	20	582	194	1 13 11
18	½	128	6¼	384	128	0 15 4
18	1	128	12½	384	128	1 0 7
20	½	109	5	327	109	0 12 9
20	1	109	10¼	327	109	0 18 0

SOILS AND MANURES.

The following conclusions as to the changes in soils due to manuring are taken from the *Monthly Bulletin*:—

I. The injurious action of alkaline manuring upon sandy-humous soils, to which is attributed the oat disease, is due to the formation of certain unknown humic bodies, which are chiefly found in those portions of the organic matter which are insoluble in alkalis.

II. Owing to the use of chemical manures, the study of humic substances is especially important. It is therefore much to be wished that abnormal occurrences in the cultivation of humiferous soils should be studied from the chemical point of view. The study of the effects of chemical manures upon humic substances is also of great importance for agricultural bacteriology.

Dealing with the efficiency of soluble manures in dry years, the same journal states:—

I. Mineral manures are more efficient than organic manures. Among the nitrogenous manures used (organic manures, oil-cakes, cyanamide, nitrate of soda) nitrate of soda yielded the best results. In most cases the other nitrogenous manures did not give any excess over the control plot.

II. The manures must be ploughed in early, excepting the nitrate of soda which should be given as a top-dressing: in February in the vineyards, in December one-third and in February or March two-thirds on cereals. For other crops the nitrate of soda is to be ploughed in with the phosphatic and potash manures.

III. There is a minimum of moisture below which manures act but little, and give no profits. According to M. Chouchak, in Crimea if the rainfall is less than 200 mm. (8 inches) from November to the end of June and on soils containing less than 15 per cent. of moisture, increase the yield by very little or nothing.

IV. Phosphatic manures are insufficient in poor soils or in those only moderately rich in nitrogen. They must be completed by nitrate of soda or by sulphate of potash.

EXPERIMENTS IN MANURING TEA IN DARJEELING.

Mr. Claud Bald, Manager, Tukvar Co., Ltd., Darjeeling, has contributed the following to the *Agricultural Journal of India*:—

It is impossible on a hill garden to find a continuous block of land where the quality of the soil is exactly equal over any considerable area, as the undulations of the land of necessity divert some of the best constituents of the soil into the hollows from the ridges, more or less, during heavy rain.

The block which was selected for these experiments seemed to all appearance as nearly equal in quality throughout as it was possible to obtain; and yet the event proved that there was some difference in favour of one side. The land was carefully measured, and the straight lines of tea bushes made it easy to plot off accurately four plots, each measuring half an acre. They were numbered from one to four. The land is slightly better in the direction, of No. 4, which has been kept as the check plot. In regard to cultivation, pruning and plucking, all the plots have been treated exactly alike; so that the experiments might determine the results of the manuring only. The experiments were continued for three years. It will be noted that no farm-yard manure has been experimented with; the reason being that on the estate no grazing is permitted, and there are very few animals kept, hence natural manure is not available in any considerable quantity, and it has become necessary to consider whether chemical or artificial manures can be applied in such a way as to prove remunerative.

In the first year the object was to find out whether the application of *castor meal* would give any encouraging result. An exceptionally heavy dressing was given to plot No. 1, while half the quantity was given to No. 3, and No. 2 was treated with *green manure* only. The green manure was a crop of *dal* similar to what is known as "*Mati Kalai.*" The crop for the year was largest from No. 4, the untreated plot, indicating that the castor meal had practically no effect upon the outturn, while the better soil in the direction of No. 1. asserted itself.

In the second year Nos. 1 and 3 were treated with *chemical* manure but, *without nitrogen*, except the small quantity contained in the castor meal on No. 1. The nitrogen was purposely omitted, as it was feared that this manure would tend to the production of rank leaf, making coarse tea. No. 4 was again almost the highest in quantity of produce ; but it was beaten by No. 2, which had been treated for two years in succession with green manure only.

In the third year No. 1 was treated with a *complete chemical* manure with the addition of a small dressing of castor meal. No. 2 again had green manure only ; while No. 3 had an application of *animal meal.* The nitrogen applied to No. 1 (in the form of ammonia), sent up the crop from that plot to the highest point ; but it was closely followed by No. 2, which made an increase on its previous record. The check plot made rather less tea than in the previous year.

Some of the outstanding facts in connection with these experiments are the high cost of chemical and artificial manures in a remote district like Darjeeling, and the extreme doubtfulness of their economic utility ; also the possibility of using expensive manures while accomplishing practically no result, in consequence of the manure used not being of a suitable composition, then there is the special outstanding fact that while green manuring is the cheapest method, it produces remarkably satisfactory results. It may be noted that the manures were used in one application only, as the nature of the ground was such that it was not advisable to dig at all during the rainy season, for fear of losing soil by wash.

An important fact in connection with the green manuring is that the crop was not dug into the land in the green state. It was only sickled when it came to maturity, and left as a mulch upon the ground until the rains were over, when the rotting stuff was dug in. At the same time a similar quantity of ordinary jungle growth was dug into each of the other plots. It is probable that the rotting leguminous crop contained a larger proportion of nitrogen than the rotting jungle ; but in any case it seems that the special benefit which accrued to plot No. 2 may be chiefly attributed to bacterial action on the roots of the leguminous crop.

The relative amount of crop having been determined as a result of the manuring, it remained to be seen whether there was any difference in the quality of the teas produced under the different circumstances. This is indeed the most important consideration of all on a hill garden, where the quality of the teas must of necessity be the first consideration. With a view to determining this a set of samples was carefully prepared from each plot, and reported upon by an expert. The valuations were 10½*d*, 11*d*., 9*d*., and 1*s*. per lb. of samples made from plots 1-4 respectively on 18th September 1911. It has been felt, however, that in order to determine the real relative value it is necessary to have a series of samples drawn from the plots at stated intervals throughout the manufacturing season, as it is well-known that some of the chemicals are so evanescent that their effects upon the teas may be very great in the earlier part of the season, while other ingredients which only become absorbed by the plant after some months may have a very different effect upon quality towards the end of the season.

A digest of the results for the three years in crop and cost is as follows :—

	1909.	1910.	1911.	Total.
	lbs.	lbs.	lbs.	lbs.
Tea per acre in				
Plot No. 1 -	247	265	345	857
,, 2 -	239	313	324	876
,, 3 -	258	270	312	840
,, 4 -	275	305	286	867

The cost of treatment works out as follows :—

	1909.	1910.	1911.	Total.
Plot No. 1	Rs. 64·0·0	Rs. 33·0·0	Rs. 44· 9·6	Rs. 141·15·6
,, 2	,, 4·9·0	,, 4·9·0	,, 4· 9·0	,, 13·11·0
,, 3	,, 32·0·0	,, 16·6·0	,, 15·14·0	,, 64· 4·0
,, 4				
Check Plot ; no expenditure.				

The total crop from No. 4 is comparatively high, because it stood relatively so high in the first year. Apart from the question of the relative quality of the tea produced, it will be seen that the extra crop from No. 3 is not sufficient to pay for the treatment which was given to it, while the cost of the treatment to No. 1 is altogether prohibitive. The valuation of the samples places No. 4 the untreated plot, much higher than any of the others while the green manured plot comes second, and the plot treated with animal manure is given a very low place. It may be remarked again, however, that the valuation for the reason above mentioned cannot be regarded as final.

EFFECT OF PARTIAL STERILISATION OF SOIL ON PRODUCTION OF PLANT FOOD.

This communication forms the second part of the report on an investigation of the zoological inhabitants of the soil, which was suggested by the increase in bacterial activity and consequently in the production of plant food in the soil subsequent to the partial sterilisation of the soil by heating or by the use of certain drugs. The authors consider that the conclusions reached previously have been confirmed and extended by the continuation of the work. Fresh evidence is adduced that bacteria are not the only inhabitants of the soil, but that another group of organisms occurs, detrimental to bacteria, multiplying more slowly under soil conditions, and possessing lower power of resistance to heat and antiseptics. In consequence of the presence of these detrimental organisms the number of bacteria present in the soil is not dependent merely on the temperature, moisture content, and other conditions of the soil. It may indeed show no connection with them; thus rise of temperature may be accompanied by a rise in the number of bacteria, or a fall, or the number may be unaffected; increase in moisture content has also proved without action. The number of bacteria depends on the difference in activity of the bacteria and the detrimental organisms.

When soil has been partially sterilised, however, the detrimental organisms are killed, and the bacteria alone are left. It is found that increase in temperature up to a certain point, favours bacterial multiplication.

The detrimental organisms are killed by any antiseptic vapour, such as that of toluene, or by heating the soil to 55°-60° C.; they suffer considerably when soil is maintained at even lower, but still higher than the normal, temperatures (e.g., 40° C. for a sufficient length of time). Cooling to low temperatures also depresses them, although it fails to kill them.

Once the detrimental organisms are killed the only way of introducing them again is to add some of the untreated soil. But the extent of the transmission is apt to be erratic, being sometimes more and sometimes less nearly complete than at others. The precise conditions governing the reintroduction have not yet been learned.

The authors provisionally identify the detrimental organisms with the active protozoa, but as the zoological survey of the soil is yet incomplete, they do not commit themselves to any particular organism or set of organisms, or to any rigid and exclusive definition of the term protozoa.

The increase in the number of bacteria following partial sterilisation by volatile antiseptics is accompanied by an increase in the rate of ammonia production until a certain amount of ammonia or of ammonia and nitrate has accumulated, when the rate falls. Thus two cases arise: (1) when only small amounts of ammonia and nitrate are present; here the increase in the number of bacteria following on partial sterilisation causes a corresponding increase in the amount of ammonia and nitrate; (2) when large amounts of ammonia or of ammonia and nitrate are present, the increased numbers of bacteria then causing no corresponding increase in the amounts of ammonia and nitrate. There is a fairly well-marked limit beyond which the accumulation of ammonia and nitrate will not go, although bacterial multiplication may still continue. The limit varies with the composition and condition of the soil.

Complications are introduced when the soil has been partially sterilised by heat, because heat effects an obvious decomposition of the organic matter, thus changing the soil as a medium for the growth of micro-organisms. The bacterial flora is also very considerably simplified through the extermination of some of the species. These effects become more pronounced as the temperature used is higher and the tendency is to reduce the numbers of bacteria. Maximum numbers of bacteria are found in soils that have been heated to the lowest temperature necessary to kill the detrimental organisms (about 60° C.). In this case the bacterial numbers and the rate of decomposition are similar to those in soils that have been treated with volatile antiseptics, and the relations between the numbers of bacteria and the decomposition noted under (1) and (2) above also hold. No relation was found, however, between the numbers of bacteria and the decomposition in soils that had been heated to 100° C. In this case, although the number of bacteria was at a minimum, the decomposition effected was at a maximum. When the bacteria are reintroduced into the partially sterilised soil by the addition of untreated soil, a still further production of ammonia and nitrate is brought about, unless too large a quantity of those substances is already present, but the depression in bacterial numbers that follows, owing to the detrimental organisms being reintroduced at the same time, generally does not check the decomposition owing to its having already gone near to the limit before the check could take effect.—E. J. RUSSELL & H. B. HUTCHINSON IN THE JOUR. OF THE AGRICULTURAL SCIENCE.

RUTHERFORD'S PLANTERS' NOTE BOOK.

The 5th edition of this useful book, the first of which appeared in 1887, has just been issued, and this fact alone goes a great way to prove the appreciation of its value. As a planter's vade mecum, revised and brought up to date, it is we believe without a rival and should find a place in every estate bungalow.

The original scope of the "Note-book" was limited to the requirements of the tea-planter, but the development of the planting industry on new lines has necessitated considerable expansion and the result is a mass of "memoranda for all connected with the planting industries of the middle East" and we may add the whole tropic world.

The name of the present editor is not disclosed, but the authorities consulted are referred to in the preface.

The general information section is as varied as could be wished for, and apparently nothing connected with the life of the planter has been lost sight of. The details of cost under every conceivable head is another valuable contribution. Then follow the notes on tea, rubber, coconut and coco with very full particulars of cultivation, and a special chapter on the important subject of manuring. The rest of the work is devoted to medical and legal information and a practical lesson on book-keeping.

It will thus be seen that Rutherford's Note book is an "Enquirer within upon Everything," a veritable planting encyclopædia carefully compiled to meet the requirements of the Tropical Agriculturist and invaluable to the planting recruit.

The system of indexing is a special feature and makes reference quite easy. We can thoroughly recommend this book to every planter, whether in the East, in Africa or on the West Indies.

* Rutherford's Planter's Note Book; Times of Ceylon, Colombo. Rs. 15.

AGRICULTURE ABROAD.

PLANTING IN UGANDA.

KAMPALA, UGANDA 7th March, 1913.

THE EDITOR, OF THE "TROPICAL AGRICULTURIST."

DEAR SIR,

I am desired by the Uganda Planters' Association to write to you upon the subject of a letter about Plantation Managers in Uganda, which appeared in *The Field* on October 19th, 1912.

The letter leaves the impression upon many minds that a young man has only to come out to Uganda and apply for a position as Plantation Manager, when he will almost at once find highly paid employment.

My Association desires me to state that whilst it is true that a small number of positions as Plantation Managers are from time to time open, it would be very inadvised on the part of anybody to come to Uganda without first having secured employment.

The expenses connected with coming to Uganda are great, the cost of living here is fairly high and the opportunities of finding highly remunerative employment are, as yet, not many.

My Association desires me further to ask if you can find space in your valuable paper for publishing this letter; and in anticipation I am requested to thank you for your courtesy.

I am, Dear Sir,
Yours faithfully,
K. BORUP, Hony. Secretary.

THE MADRAS AGRICULTURAL DEPARTMENT STATIONS.

These farms, or Agricultural Stations as they are called, are under the immediate control of two Deputy Directors, one for the Northern Division, chiefly comprising the Telugu Districts and another for the Southern Division, comprising the Tamil and West Coast Districts. Only the Central Farm at Coimbatore is under the control of the Principal of the Agricultural College. Working under these three officers, there are a number of Farm Managers and Assistant Farm Managers, either in immediate charge of farms or doing special duty in district work, popularising, amongst cultivators, such methods as have been proved suitable by experiment.

Under the Dy. Director of Agriculture, Northern Division, there are now three farms stationed at Samalkota, Nandyal and Hagari, three farms originally started at Bellary, Hindupur and Bezwada have been given up for various reasons. A new farm is proposed to be opened at Anakapalle in the Vizagapatam District

The *Samalkota Agricultural Station* (Godaveri District) :—

The history of this farm may be briefly stated as follows :—

A disastrous disease appeared among the sugar-canes in the Godaveri delta, which was caused by a fungus, *Colletotrichum falcatum*. Healthy canes were imported from Hospet and distributed to the ryots in 1901 with very little success. The Government Botanist, to whom the matter was referred at the time, proposed that a small area should be rented and all the available varieties should be collected and grown for comparison and study with a series of experiments in manuring and cultivation. The origin of the station, therefore, was to discover the causes underlying the severe attack of the fungus above referred to, popularly known as the *red rot* fungus. The work was extended in later years to the cultivation and manuring of paddy and of fibres, chiefly jute.

The Nandyal Agricultural Station (Kurnool District) :—

This station was opened in April 1906 and is situated on a well defined flat basin called the Nandyal valley between two ranges of hills, the Erramalais and the Nallamalais. The soil consists chiefly of regur and, except a small portion irrigated by the Kurnool-Cuddapah Canal, the area is under dry crops, cotton and cholan (Sorghum) being the most predominant. The object of this station was the improvement of the local cottons known as the 'Northerns' and the investigation of the cholam crop, with the possibility of a wider introduction of a leguminous crop into the rotation. The farm consisted of 40 acres but an addition has been made this year.

The Hagari Agricultural Station (Bellary District) :—

The circumstances which brought into existence this farm and the problems which were sought to be solved by it are the following :—

When the erection of a number of pumping stations was sanctioned by Government in 1905, the officer in charge of the pumping stations was asked by Government to erect one on the banks of the Hagari River with a view to the water so raised being used to irrigate black cotton soil, a large area—nearly 4 million acres—of which was to be commanded by the proposed Tungabhadra Reservoir. Questions relating to cropping and yield were to be studied and assessment and the duty of water were sought to be fixed by such study. The main object of this station was, therefore, to discover the most profitable method of applying water to black cotton soil and the two crops taken for study were paddy grown as a wet crop and cotton as an irrigated dry crop. The soil consists of 225 acres, made up of 100 acres of regada, 80 acres of mixed soil and 45 acres of sand dunes. The mixed soils were chiefly used for growing fodder crops for the stock and it was chiefly in the black soils that the experiments were conducted. A few experiments on warping or basin irrigation were also started. The Tungabhadra Reservoir Project has been abandoned, and the irrigation experiments have now been given up and experiments on dry crops on lines similar to those at Nandyal are now chiefly carried on, along with some garden cultivation.

Under the Deputy Director, Southern Division, there are now 4 agricultural stations, located at Palur (South Arcot District), Koilpatti (Tinnevelly District), Taliparamba (N. Malabar District) and Manganallur (Tanjore District) and one farm started at Attur (Chingleput District) on the Palar river has been abandoned.

The Palur Agricultural Station (South Arcot district):—

The Palur Farm, as its original name, the South Arcot Groundnut and Sugarcane Farm, indicates, was started with two well-defined objects. The one was to make a general study of the groundnut industry including the collection of new varieties and to examine the local methods of cultivation and the diseases affecting the crop. The other was that the farm was intended to be a nursery from which the improved varieties of sugarcane raised at the Samalkota Farm might be distributed to the southern districts. The local cane industry was to be studied and inferior varieties were to be replaced by superior ones. The area consists of 25 acres of wet land and 32 acres of dry land, a portion of the latter being irrigable from wells, so that the cropping can be considered under three main headings, viz:—Wet crops, dry crops under well irrigation, and dry crops under dry cultivation. Experiments on paddy have since been added and useful results have been obtained on single seedling transplantation, green manuring and application of mineral manures.

The Koilpatti Agricultural Station (Tinnevelly District):—

The Koilpatti Farm was acquired as early as 1901 and consists of two blocks, a red soil area of 25 acres and a black soil tract of 115 acres, the two blocks being more than a mile from each other. Each block represents a typical agricultural tract of the Tinnevelly District, known locally as sevval and karisal. The red soil contains a number of wells in which the water supply, however, is scanty and is cultivated usually with the hardy cereal and pulse crops. Cotton is the principal crop on the black soil area. The most important work achieved here is the obtaining of good strains of *karunganni* cotton by careful seed selection and the introduction of Ceded Districts implements like the gorru and the dantulu. A number of cotton seed farms have been established in the villages in co-operation with the ryots and pure seeds are collected from these seed farms and sold to ryots, along with Cambodia cotton seed for which there is now a great demand.

The Taliparamba Agricultural Station (North Malabar District):—

The Taliparamba Farm was opened in 1905 for a study of all aspects of pepper cultivation. The lines on which the pepper crop was proposed to be investigated were (1) the seasons and how they effect the setting of the pepper, (2) the varieties and strains of pepper, (3) standards and shade, (4) cultivation and method of propagation and (5) manuring. In addition to pepper, a study of the conditions affecting local agriculture in general was added on from time to time and experiments on the culivation of paddy, sugarcane, groundnuts and other crops have been taken up. The land consists of a picturesque hilly tract which contained, at the time of purchase, some areas under pepper in various stages of growth and bearing.

The Manganallur Agricultural Station (Tanjore District):—

This Farm was started just a year ago for an experimental study of the cultivation of the paddy crop in the deltaic portions of the Tanjore district and consists of about 87 acres of alluvial land leased for a period of 7 years from a Mirasdar.

The Central Agricultural Station, Coimbatore.

This Farm, as already stated, is under the direct control of the Principal of the College who is also Superintendent of the Farm, *ex-officio*. The objects of this Farm are manifold:—

First:—it serves the purpose of affording facilities for students of the College for performing different field operations and marking observations of crops ;

Second:—it contains a large area of black cotton soil on which dry crops of cotton, cholam or Bengal gram are grown ;

Third:—there is an area of red soil, part of which is irrigable from wells;

Fourth:—there is a portion of black soil, typical of the Coimbatore garden soil, commanded by well irrigation ;

Fifth:—there is a large area of wet land under tank irrigation, growing paddy and sugarcane, in addition to green manure crops ;

Sixth:—the farm herd consists largely of Kangayam cattle and there is a well-equipped Dairy attached to the Farm.

The work on the Central Farm is, therefore, partly educative and partly experimental. Most of the crops of the Presidency can be grown here and that is its chief advantage over the old Saidapet Farm.—JOURNAL OF THE MADRAS AGRICULTURAL STUDENTS' UNION.

SOUTH AFRICAN GOVERNMENT AGRICULTURAL SCHOLARSHIPS.

The South African Union has awarded five Government scholarships in agriculture, for the purpose of enabling the holders to study abroad. Only the sons of parents permanently settled in South Africa were eligible. The value of the scholarships is £150 per annum for a period of three or four years, at the end of which time the holders are pledged to enter the service of the South African Union for at least three years, at a salary of not less than £300 a year.—UNITED EMPIRE.

CACAO IN THE FRENCH COLONIES.

The amount of cacao imported into France has progressed regularly from 2000 tons in 1850 to 27,000 tons, representing a sum of £1,850,000 in 1911.

Of this, the amount of re-exported cacao was double that consumed. The cacao imported into France during the last few years comes principally from Venezuela, Brazil, Ecuador, St.Domingo, the Gold Coast, Colombia, San Thomé, Trinidad and Haiti. The re-exported cacao was sent chiefly to Germany, Switzerland, England and Belgium. In 1911 4,149,952 lbs. of cacao was imported into France from the French colonies (50 per cent. of duty remitted); this was divided as follows:—

Guadeloupe ...	2,332,733 lbs.	Madagascar ...	45,797 lbs.
Martinique ...	1,336,237 ,,	Ivory Coast ...	33,174 ,,
Congo ...	237,833 ,,	Guiana ...	27,652 ,,
New Hebrides ...	88,000 ,,	Reunion ...	2,471 ,,
Mayotte and the Comoro Islands ...	56,056 ,,		

At Guadeloupe all the cacao plantations are to be found at "Basse Terre," where the area which can be used for this purpose is not estimated at more than 6,000 or 7,500 acres.

At Martinique the cacao was introduced in 1661 by means of seeds from Venezuela. The area suitable for cacao cultivation is estimated here at above 7,400 acres.

The first serious attempts at growing cacao in the French Congo date from 1887 (the creation of the Libreville Experimental Garden); the first plantations were made in 1889. The latter have developed particularly on the coast zone and especially at Gabon in the district of Libreville.

At Mayotte and its dependencies this cultivation is of recent origin.

The only part of Madagascar where cacao trees have any chance of development is the coast district, approximately from Vohemar in the north and Mahanoro or Mananjary in the south. At the present time, the Madagascar cacao comes in the first place from the Tamatave district and secondly from the districts of Andevoranto, Vatomandry and Mahamoro. The first exportations were in 1896.

On the Ivory Coast, attention is beginning to be paid to the cultivation of the cacao tree. The first export of the products took place in 1900; and the excellent quality of this cacao was proved by industrial tests made in 1912 under the supervision of the Colonial Garden.—BULL. DU JARDIN COLONIAL, No. 108 March, 1912.

Although the cacao tree has been found growing wild in certain parts of Guiana, where the climate as well as the soil are very suitable to its requirements, this tree has never been grown in the colony to any extent. It appears that this is due for the most part to the scarcity and cost of labour.

Cacao production might be a source of revenue to Cochin-China, Cambodia and South Annam, but so far the tree has only been grown experimentally in these countries.—EM. PRUDHOMME IN ANNALES DE LA SCI. Agronomique.

SUGAR AND COCONUTS IN BRITISH GUIANA.

The following extracts are from the Report on the Department of Science and Agrculture of British Guiana for the year 1911—1912 :—

SUGAR.

The sugar-cane experiments were carried on at the Experimental Fields under the supervision of the Agricultural Superintendent. The crops were not reaped until December 1911 owing to the dryness of the weather. The crop was a short one; the rainfall was 20·38 inches less than the average rainfall from August to the end of December 1911. The average yields and characteristics of the expressed juices of the varieties under the various conditions of manuring in the large plot-series of trials showed that 25 varieties gave yields higher than Bourbon and that 29 varieties under the normal manuring—300 lb. of sulphate of ammonia per acre did similarly. The best results were obtained from varieties D 118, 216, 145, 419, 625, 294, 721 651, 642, 4395, 317, 504 and 420.

The experiments with nitrogenous manures again confirmed previous experience. Beneficial effects were clearly demonstrated with all varieties under trial. The heavy rainfall during the first four months of the year, and the sudden cessation of the rains early in August were disastrous to a vigorous growth of canes. The period of active growth was short and many varieties were not able to make full use of manurings equivalent to 300 lb. of sulphate of ammonia per acre and were unable to make use of heavier dressings. As in 1910 and in several other years the manurial value of nitrate of soda proved to be much lower than that of sulphate of ammonia. This Department is now in possession of numerous proofs that the sugar-cane shows a distinctive preference for ammonia over nitrates as its source of nitrogen.

Comparisons were continued of sulphate of ammonia, nitrate of lime, nitrate of soda, nitrolim (Calcium cyanamide) and dried blood as sources of nitrogen when applied in proportions equivalent to 60 lb. of nitrogen to the acre. These trials have only been made during two years—the meteorological conditions of both of which were unfavourable for the action of nitrates. It is not desirable therefore to draw deductions from them yet as to the effects of nitrate of lime as compared with those of sulphate of ammonia.

Trials were also made with potash and phosphates. The addition of sulphate of potash and superphosphate of lime to the manurings of sulphate of ammonia has not been pecuniarily advantageous. Slight increases were obtained from manurings with superphosphate and slag phosphates but were not remunerative.

COCONUTS.

A marked increase in the area under coconuts is recorded by the acreage returns. It is reported that at the end of 1911, 12,236 acres were under coconuts. Increased interest is being taken in this industry, and a further and very considerable increase in the area planted can be looked for. It is to be regretted that little attention is paid to the proper drainage and cultivation on the majority of the coconut properties in the colony. The proportion of "select" coconuts in those raised in the colony is low, and consequently the export of coconuts is small, and the greater proportion of those grown has to be manufactured into copra or oil. On the neglected cultivations diseases are prevalent in some districts. A large number of trees die in the colony each year from the want of adequate drainage; bud-rot is common in some parts; whilst a fungoid disease of the nuts occurs in some localities on the East Coast. Beetles are found in some plantations and caterpillars of *Brassolis sophorœ* still occasion considerable damage to the palms. Efforts have been made by the Department generally, and by the Local Government Board in the village to arouse interest in thorough cultivation of the plants and in the control of their pests and diseases, but if increased interest is not taken by the bulk of the coconut growers it may soon be necessary, for the safety of the coconut industry, to have recourse to legislation to affect the control of both insect and fungoid pests.

SPICES.

CLOVES IN THE SPICE COLLECTION, PERADENIYA GARDENS.

To the average visitor to the Royal Botanic Gardens, Peradeniya, the spice collection offers one of the greatest attractions and is always sought after by persons who wish to acquaint themselves in the shortest time possible with the actual trees, shrubs or climbers which produce the spices of commerce. Apart from their intrinsic value spices have always had a peculiar fascination for many people, and passengers or tourists who believe too implicitly in the oft-quoted spicy breezes of Ceylon eagerly look forward to realising their conjured visions of the land where every prospect is supposed to be so alluring and redolent of pleasant aromas. Collected and grown together here are specimens of all principal spice-yielding plants of the tropics—Nutmegs (with which is also closely associated Mace), Cloves, Cinnamon, Allspice, Vanilla, Pepper, Cardamoms and others—all conveniently situated near the main entrance to the Gardens. At all periods of the year some of these spices may be seen in season, some in flower while others are in fruit. Here are some of the finest nutmeg trees in the East, being upwards of 80 years old and some eighty feet in height, and bearing two crops a year.

The season for cloves is invariably in January or February, though in some years the trees fail to produce any crop. It is common knowledge that cloves are the dried flower buds, produced by a small or moderate-sized, conical fragrant tree ; this is known botanically as *Eugenia caryophyllata* and belongs to the natural order *Myrtaceæ*, a family of plants noted for their fragrance. The tree is a native of the Moluccas, to which the supply of the spice was at one time rigorously confined being a monopoly of the Dutch Government. Now, however, the chief source of supply is Zanzibar, next to this in importance being Penang, Amboyna and Madagascar. Ceylon Customs give the export of cloves (with which for some obscure reason is included mace) from the island for 1911 as 145 cwt. valued at Rs. 7,891. The quantity of cloves exported from Zanzibar in 1911 is given as 9,055 tons valued at £330,410. The tree is propagated from seed, which in the fruit is known as Mother-of-Cloves. The young plants are of slow growth, and seven or eight years must elapse before a maiden crop can be expected. The tree requires a hot and moderately moist climate, and thrives in Ceylon from sea-level to about 1, 600 feet elevation.

H. F. MACMILLAN.

CUMIN.

Cumin, or cummin, is the dried fruit of *Cuminum Gyminum*, Linn, an annual plant native to Egypt and the Mediterranean region, and found in cultivation in Arabia, India and China. The plant is said to ripen its seeds as far north as Norway, but Morocco, Malta and Sicily furnish the chief supplies.

The cumin plant is a slender annual, 1 to 2 feet high, with twice or thrice tri-partite leaves deeply cut into filiform segments ; the fruits resemble those of the caraway plant, but are larger and lighter in colour and have nine ridges on each half (mericarp).

"Black cumin," which is extensively cultivated in India, is the seed of *Nigella sativa*, a ranunculaceous plant native to Southern Europe, and quite distinct from true cumin.

USES.

Cumin seed was formerly used as a common flavouring spice in England, and is so employed in Germany at the present time, but elsewhere in Europe it has been largely replaced by caraway. In Holland it is said to be used for flavouring cheese. It is largely used as a spice and curry ingredient in India, where considerable importance is also attached by natives to its medicinal properties. In Europe the medicinal use of cumin is confined to veterinary practice. The seeds are powerfully aromatic, but are hotter and far less agreeable to the taste than caraway. They yield a volatile oil, known as "oil of cumin," which is employed in European countries in the manufacture of liqueurs. The following table, quoted from Gildemeister and Hoffmann's *Volatile Oils*, gives the percentage of oil obtained from the principal commercial kinds of cumin seed used for distilling:

East Indian	...	3.0-3.5	Morocco	...	3.0
Maltese	...	3.5	Syrian	...	2.5-4.0

Germany is by far the largest consumer of cumin ; France and Spain rank next, in the order named. A considerable quantity of cumin seed is exported from India, the United Provinces and the Punjab being the chief producing provinces. The modern traffic is almost exclusively from Bombay and Bengal, the exports being consigned for the most part to Ceylon, the Straits Settlements and British East Africa. India also imports considerable quantities of cumin seed across the North-Western land frontier and from the Red Sea and Persian Gulf ports. The chief trade centres are Jubbalpur, Gujarat, Rutlam and Muscat.

The Indian exports for the past three years are as follows :—

1909-10		1910-11		1911-12	
Quantity	Value	Quantity	Value	Quantity	Value
cwt.	£	cwt.	£	cwt.	£
23,936	38,450	28,090	45,045	25,330	39,983

In Malta the area under cumin in 1911-12 was returned at 1,594 acres, and the produce (13,256 cwt) was exported chiefly to France (5,075 cwt.), Italy (4,100 cwt.), Germany (1,512 cwt.) Holland (668 cwt.), and the United Kingdom (645 cwt.). The value of the total export was £14,374.

The exports of cumin seed from Morocco for the year 1909 were valued at 295,897 francs (£12,329).

The current price of cumin in London is as follows: Good Morocco, 25*s.*; Fair Malta, 22*s.* per cwt.—IMPERIAL INSTITUTE BULLETIN.

CINNAMON CULTIVATION IN INDIA.

Cinnamon being one of the chief products of this Island during the Dutch *regime*, the following extracts culled from *The Indian Agriculturist* will, we believe, be of some interest to our readers:—

The cinnamon plant will grow in any ordinarily good soil where the rainfall (85 to 100 in.) and temperature (averaging 85°) are adequate, so long as it is not rocky or dry. The best flavoured bark is produced on poor white sandy soil where there is an average temperature of about 83° and an average rainfall of about one inch for every degree. There is, however, a deep stratum of rich mould below the sand, and where this is lacking the trees are not worth cutting. These prime conditions are met with on the slightly elevated lands of about fifty miles of the coast of the western province. Further south the sandy lands are lacking, while further north the climate is too dry. On marshy land the plant tends to give a bitter bark. The tree may be grown from seed or propagated by root stumps, layers or cuttings. The first method is that usually adopted, from half-a-dozen to a small handful of seeds (washed free from pulp) being sown in prepared holes on the plantation, or singly (9 to 12 inches apart) in nursery beds. The nursery seedlings are ready for transplanting in three or four months. Excessive dryness leads to non-germination or drying off. Many planters prefer to transplant the seedlings in clumps of about half-a-dozen. Plants are usually arranged about ten feet apart, or approximately 450 to the acre. Seedlings yield a crop in the second or third year, when the solitary stem is cut down to within four or six inches of the ground. The second crop is three or four times as large. In the seventh or eighth year the bushes have grown so big that the peelers can hardly get between them, the yield of bark continuing to increase until the tenth year. The average crop of cinnamon bark per acre is 100 lb. Stools in some of the cinnamon gardens are very large and evidently of great age. Weeding is done regularly, the weed refuse being used as manure. In cultivation the continual low coppicing induces the production of long, straight clean shoots, as from these the best quilled bark is obtained.

Cutting begins during the heavy rains in May and June, and again in November and December. At this period the sap is in active circulation and the sticks peel freely. The crop may be got out at one cutting, but if the season is a good one the bushes may have to be cut over two or three times.

The bulk of the crop is obtained from shoots of two years' growth. The tops and branches are lopped off by means of a long sickle-shaped hook called a "catty." The sticks are collected, dressed, tied in bundles, and carried to the "wadi," or peeling shed.

PEELING.

Peeling is performed with a small sharp-pointed knife with a projection at one side for ripping. The operator takes the stick in his left hand and rings it at distances of about a foot-and-a-half. He then slits it longitudinally from end to end, working the knife between the bark and the wood until it is raised about half-an-inch wide. Turning the stick he draws another slit parallel to the former, working the knife on that side until the bark is detached. Sticks that do not peel freely are rubbed with a piece of hard wood, facilitating the removal of the bark. The slips of bark are packed together and these packs piled into a small enclosure of sticks, are covered with scrapings and bound with a mat. This serves to keep in the moisture and soften the cuticle for next operation. Piping is carried out on the following morning by an operator who has in front of him a small tripod of three sticks tied at the point of crossing. This serves as a support for a fourth stick, the end of which rests on the ground. Taking a slip of bark the operator places it on the stick, and holding the upper end with his foot, he scrapes off the cuticle with a small curved knife having a slightly serrated edge.

The middle section yields bark of the best quality, that from the base being thicker and inferior.

The pipe-maker proper is furnished with a board about 3½ feet long, a measuring stick, and a pair of scissors. He sorts the prepared slips into various qualities, and, selecting one suitable for the outer cover of the pipe, trims it and cuts the ends square with the scissors. Then placing it on the board he proceeds to pack within it as many of the smaller pieces as will close over it when dry. Then he pushes it along the board, adds and fills another slip until it attains the proper length. At the close of the day the pipes are in parallel lines stretched across the shed, where they are left until firm enough for handling. This operation puts the final touches to the quills, the edges of the outer pieces being pressed in and the ends dressed where necessary. On the second day the pipes are placed on wicker work frames in the open air. Direct exposure to the sun is apt to produce warping and mat coverings are used to prevent this. When sufficiently dry, the quills are sorted and made up into bundles of about 60 lb. to 65 lb. A well-formed pipe of cinnamon is of uniform thickness and colour, the edges neatly joined in a straight line from end to end, the joints of the cover being neat and close. The finer sorts have some fifteen to twenty pipes to the pound, and the inferior grades range from ten to fifteen. Coarse bark is generally

baled without regard to appearance. Formerly planters took great pride in their marks, paying special rates to the best peelers. In consequence the finest quills were composed of excessively thin aromatic bark of very fine appearance. These qualities really cost more to produce than they are sold for, and are now rarely met with. The bark exported from Ceylon of late years has been gradually getting poorer in appearance. The parings from "unpeelable" branches, broken chips, and trimmings constitute the "cinnamon chips" of commerce.

CORIANDER.

The plant which yields the coriander seed of commerce is *Coriandrum sativum*, Linn. It is native to Central Europe and the Levant and is now cultivated in many countries, especially in Moravia, Thuringia and Russia, whence comes the bulk of the European supply. As a cultivated plant coriander is found all over India, and the spice is exported in considerable quantities, the trade showing an increase during recent years. It is grown in the south of England to a small extent, being sometimes mixed with caraway, the coriander yielding a crop the first year and the caraway during the years following. The coriander plant is an annual herb 1 to 2 feet high, with a much-branched stem furnished with finely divided leaves. The small flowers, borne in terminal umbels, are of a rose-white colour; the fruit is globular in shape, with the remains of two stigmas projecting from the top; it easily splits into two halves, the inner sides of which are concave. Before it is ripe the fruit has an unpleasant odour. When ripe and dry it is pleasant to the taste and aromatic.

SOIL AND CULTIVATION.

In warm countries the sowing takes place during the cold or rainy season; the seed is sown broadcast in sandy loam or black soil. It takes from three to four months to ripen, and the crop requires to be weeded once or twice during that period. In India the seed is sown broadcast after being first rubbed between the hands to separate the halves (mericarps) of the fruits. The sowing takes place at various seasons in the different provinces: in Bengal and the United Provinces the seed is sown during the cold season, in Bombay during the rainy season, and in Madras during the autumn. The seed germinates in about three days, and requires only two weedings. In about a month from sowing the seed has formed, and after it has ripened the plants are pulled and the crop obtained by threshing with a flail, or it is trodden out by bullocks. After being dried in the sun the seeds are stored in bags.

In European countries the seed is sown in September in drills a foot apart, preferably in light, rich soil ; about 15 to 20 lb. of seed is required to sow an acre. The young plants are thinned to about 6 or 8 in. apart in the rows. In spring the soil is hoed to keep down weeds. The flowers appear in June and the seed ripens during August. On account of the disagreeable odour of the unripe seed, it must be allowed to remain on the plants until thoroughly ripe. To avoid loss by handling it is advisable to harvest the crop by cutting off the seed-bearing umbels and placing them in bags, rather than to cut down the whole plant. The seed is easily obtained by lightly flailing the plants or umbels in the field—a cloth being spread to receive it.

The average yield from good soil is about 15 cwt. per acre.

USES.

In Eastern countries coriander enters largely into the composition of curries, it is also valued in medicine, and is used for flavouring spirits. The chief value of the coriander in Europe is as a source of an essential oil, which is obtained by steam distillation, and coriander from Moravia, Thuringia and Russia is chiefly used for distilling. The following figures quoted from Sawer's *Odorographia* give the percentages of oil yielded by various kinds of coriander seeds :

Moravian	...	0·8	German (Thuringian)		0·6 to 0·8
Dutch	...	0·6	Italian	...	0·5
East Indian	...	0·2	Morocco	...	0·2 to 0·6
French	...	0·4	Russian	...	0·8 to 1

The residue after distillation is used as a cattle food. It contains 11 to 17 per cent. of proteins and 11 to 20 per cent. of fat.—IMPERIAL INSTITUTE BULLETIN.

SERICULTURE.

THE SILK INDUSTRY AND TRINIDAD.

This seemingly insignificant insect has now become one of the most important to man of all domestic animals. It was originally a native of China from Serica or Serinda and the neighbouring parts of Asia, and was there bred and domesticated for a long time before it was known to Europe.

Now the manufacture of silk is one of the most important sources of wealth to many parts of that Continent. At first silk stuffs were sold for their weight in gold; but they are now comparatively cheap.

THE SILK WORM.

The silk worm is a caterpillar, which in due time undergoes its metamorphoses, and becomes a moth, like others of the genus. At birth, and for the first ten days, the colour of the worm is blackish or obscure. As it grows it casts its skin at stated periods and turns whitish or bluish and, when ready to spin, becomes yellow.

It feeds on the mulberry which grows very well in Trinidad. Before spinning it fasts for thirty-six hours, voids all its excrements, becomes soft and flaccid and seeks a suitable place for the construction of its cocoon. Two or three days are occupied in this work and the thread is stated to be sometimes 900 yards in length. The worm then changes to a crysalis and after remaining 15 days in our Trinidad climate the moth comes out forcing its way through the cocoon. The males first appear and are very brisk in their motions but do not fly. They live but a few days and the female perish also as soon as they have deposited their eggs. The eggs are attached, often to the number of 500 or more by means of a gummy substance, and hatch in Trinidad by artificial incubation.

THE REARING.

The successful rearing of silk-worms is a distinct art and requires peculiar attention. The "Silk" which is the produce of the silk worm is passed through two small holes in its head; the two filaments thus passed out by a combined movement of the mouth and front legs of the animal are combined into one, being bound closely together by a gummy liquid. This long filament, extending sometimes to a mile, is spun into the shape of an egg-shaped ball, in the interior of which the worm is enclosed. When its labour ceases, we have what is called a silk cocoon an inch and a half in length, of a pale yellow or orange colour. The cocoons are next subjected to heat which kills the moths imprisoned within.

The exterior of the cocoon being the first part spun by the animal, is of poor quality and is termed floss silk. This floss silk covering is taken off and exposes the hard Cocoon of one continuous thread of fine silk below. The method by which this thread is taken off is known as reeling.

In Britain, the annual value of the silk manufacture is estimated by millions sterling, more than nine-tenths of which are for home consumption. The chief supplies of raw material are drawn from Bengal; from Italy, which produces also millions of pounds annually; from China where next to tea it is the staple article of export; from Turkey; and in smaller quantities from Holland, the United States and other countries. The foreign states from which the manufacture chiefly exists are China, India, Italy, Switzerland and France.

It has been estimated that millions of human beings derive their sole support from the culture and manufacture of silk.

In conclusion I may quote the words of the great Sericulturist, J. de Loverdo, who said: "That no material work offers to the same extent as the rearing of silk-worms such a remarkable example of the power of industry as creative of wealth."

A few weeks' experience suffice to direct and follow the development of the innumerable seeds in their diverse and marvellous transformations, which are so attractive and captivating.

May that example arouse some spirit of emulation and bring to the knowledge of the Trinidad public the importance of the silk industry and possibility as another source of industry, which would add to the prosperity of our beautiful island.—C. GLANDON in the TRINIDAD AGRICULTURAL SOCIETY PROCEEDINGS.

THE ARTIFICIAL SILK INDUSTRY.

RECENT PROGRESS.

The following observations on recent developments and the present position of artificial silk production in France have been forwarded by Mr. Frank H. Mason, the United States Consul-General in Paris, to the Department of Commerce and Labour at Washington :—

Considerable progress was made in the manufacture of artificial silk in France during 1912, and on account of the increased prices prevailing for true silk, largely augmented profits were realised. The French company exploiting the viscose patents in France had a profit for the year of about £66,000, an increase of £16,000 over 1911. This profit was in no way due to an increased production : the daily output of the company in both years amounted to 1,763 lb., or about 530,000 lb. per annum. The net profit per lb. was thus about 2*s.* 7*d.* The increased profits were due to higher sale prices and a decrease in the cost of manufacturing.

The factory, situated near Dieppe, is taxed to its utmost capacity, and the demand is such that a larger output is of the most urgent necessity. The double looms at present at work consist of 40 lines each of 50 shuttles or 2,000 shuttles in all; these looms can be lengthened by 5 shuttles. In addition, trials of electric power on the looms have given most satisfactory results; 100 shuttles are now electrically driven, and 250 additional shuttles

of the same design are on order. The production of the electrically driven looms is four times that of those now in use, and in this way the company hopes to be able to produce over 2,204,600 lb. yearly, the consumption of which is already assured on account of new uses found for viscose silk for millinery, curtains, furniture covers, etc. The company states that, provided it can effect a still further slight reduction in cost, artificial silk can be sold cheaper than cotton goods.

COST OF PRODUCTION.

Information which the Consulate has in hand would indicate that viscose silks cost under 5*s*. 11¼*d*. per kilo. (2*s*. 9½*d*. per lb.) to produce, whereas the cupro ammonium silks cost 9*s* 6*d*. per kilo (4*s*. 6*d*. per lb.) and those made by the Chardonnet process (from nitrocellulose) 12*s*. (5*s* 5½*d*. per lb.). None of these silks, however, can be used alone, but must be mixed with wool, cotton, or real silk. In addition, they will not wash. There are now 33 plants manufacturing under the viscose patents, distributed all over the world, the royalty payable to the inventors being stated at 2*s* 6*d*. per lb.

NEW PROCESSES.

Within the last year and a half, two new inventions have been brought out in France for the manufacture of artifical silk—one at Rouen and the other at Harfleur, a suburb of Havre. The latter, however, which is being exploited by a prominent French cotton firm, is in the experimental stage. Both of these inventions are based on the use of raw cotton instead of wood pulp, and both claim to have overcome the difficulty found with the viscose patent, that of non-washing. The company having its works near Rouen is at present turning out daily about 580 lb. of artificial silk, some of which is entrusted to a Lyons silk manufacturer, who is assisting the firm in its enterprise, the balance being sent to a well-known firm of American silk manufacturers, who are said to be most enthusiastic about it.

It is said that skeins of silk produced by this firm have been submitted to an independent London expert, by whom they were soaked in water for some time, wrung out, and then rough-dried in an ordinary oven at a high temperature. On comparison with unwashed samples the expert declared that he could not find any difference as to either brilliance of colour or tensile strength. The inventors claim that a test dress made wholly from this silk, without any admixture of cotton, wool, or real silk (such as is necessary with wood-pulp silk), was worn during the summer of 1911, and that on examination after the test experts declared that it had worn quite as well as if not better than, true silk.—INDIAN TRADE JOURNAL.

GENERAL.

SORGHUM AS A FODDER CROP.

The question of growing some crop or crops suitable for feeding cattle—particularly in those parts of the Island subject to periodic droughts when the natural herbage is killed out—is one that is growing in importance every day.

The difficulties in the way are to get land-owners to realize the necessity of cultivating fodder crops suitable to local conditions.

In the neighbourhood of large towns the two cultivated fodders are Guinea grass (*Panicum maximum*) and Mauritius or water grass (*Panicum maticum*), but both these require good cultivation for successful growth and it pays the cultivator to weed, manure and irrigate where he is likely to sell the produce at a good price. Under the conditions usually found in the Island what is wanted is some hardy plant that stands drought fairly well. All things considered, the most likely to suit is one or other of the various species of Sorghum, and of these perhaps the giant millet (*Sorghum vulgare*) is probably the most suitable.

In India the area under this crop runs to millions of acres. There it is grown both as a cereal and a fodder crop—in the latter case taking the place of rice in parts where the rainfall is scanty. It may be grown as a pure crop or a mixed crop, in which case it could be sown along with a legume.

The land should be ready for sowing with the rains. For fodder purposes the seed is sown thick to produce a heavy crop of fine thin stalks. For grain about 8 lb. of seed per acre should suffice and a distance of 12 in. to 18 in. observed; but for fodder 50 to 60 lb. should be sown broadcast. The variety known as "Sundia Jowari" is considered one of the best for fodder purposes. The stalks should be cut when in full flower, and a good crop will stand 8 or 10 ft. high.

The out-turn of green fodder per acre should under favourable conditions be 20,000 to 30,000 lb. If continuous cultivation is to be kept up, sorghum should rotate or be grown together with a leguminous crop.

Cultivation can be carried on upon high lands or in suitable fields in place of the short paddy crop, and the fodder could be dried off and stored away for use when pasture is scarce. "Sundia Jowari" is in full flower and ready for cutting as fodder within 10 weeks after sowing.

The Secretary, Ceylon Agricultural Society, Peradeniya, will be glad to procure seed for intending growers.

C. D.

CEYLON BOARD OF AGRICULTURE.

MEETING OF MAY 9th, 1913.

Minutes of a meeting of the Board of Agriculture held at the Council Chamber at 12 noon on Friday, May 9th, 1913.

His Excellency the Officer Administering the Government presided.

Others present included:—The Hon'ble the Acting Colonial Secretary, the Hon. Mr. A. S. Pagden, Sir Solomon Dias Bandaranaike, the Director of Agriculture, the Director of Public Instruction, Dr. H. M. Fernando, Dunuwile Dissava, Mudaliyars Tudor Rajapakse, A. E. Rajapakse, W. Dias Bandaranayake, A. V. Atapattu and S. Weerackkody ; the Government Entomologist, the Acting Agricultural Chemist, Messrs. D. S. Corlett, G. Harbord, James Peiris, W. A de Silva, Gerard A. Joseph, A. N. Galbraith, and as visitors (representing the Ceylon Poultry Club):—Messrs. Alfred Lewis, H. L. De Mel, W. P. D. Vanderstraaten, M. J. Cary, and the Secretary (Mr. C. Drieberg).

The minutes of the previous meeting held on 3rd February, 1913, were read and confirmed.

Dunuwile Dissava moved and Sir Solomon Dias Bandaranaike seconded the adoption of Progress Report No. 62, which was approved.

Statements of Expenditure for January, February and March, 1913, were tabled.

Mr. Galbraith read the report of the All-Ceylon Exhibition Committee. Mr. Harward, in proposing the adoption of the Report, highly commended the work of the Committee and particulary mentioned Mr. Galbraith who had come forward at a critical time to assist them. Mr. Tudor Rajapakse seconded. Mr. Booth wished to acknowledge the services rendered by Mr. Denham. The report and vote of thanks were adopted.

Mr. Alfred Lewis submitted certain proposals for the amalgamation of the Poultry Club with the Agricultural Society. Mr. Henry De Mel moved that the following Committee be appointed to go into the question and make a report before next meeting:—F. J. Reiss, H. L. De Mel, M. J. Cary, Alfred Lewis, the Director of Agriculture and Mr. Drieberg, with power to add to their number. This was approved.

The Director of Agriculture reported progress made with regard to the question of a College of Tropical Agriculture for Ceylon. Dr. Fernando proposed the following motion which was seconded by Mr. James Peiris, and unanimously adopted:—"That the Hon'ble Mr. Edward Rosling be appointed Deputy of the Board of Agriculture, Ceylon, to the London Committee to arrange a deputation to the Secretary of State to urge the claims of Ceylon as a site for an Imperial College of Agriculture."

The Director of Agriculture referred to the proposed Coconut Trial grounds and the negotiations so far made for acquiring land in the Chilaw district.

A meeting of the Society followed, with the Director of Agriculture in the Chair.

Mr. Corlett read his paper on "Cotton in Egypt" for which he was thanked by the Chairman. Dr. Fernando and Mudaliyar Weerackkody offered remarks.

Mr. W. A. de Silva read a paper on "Problems connected with village Cultivation." After some remarks by Mr. Weerackkody, the Director thanked Mr. de Silva for bringing up the question of chena cultivation, which was being so much discussed of late. He expected shortly to go into the matter.

DATES.

PHOENIX DACTYLIFERA

The Ceylon Agricultural Society having imported from Cairo in January last 40 date palm suckers, the following article on dates from the *Pomona College Journal of Economic Botany* will be of some interest.:—About 7,000 date off-shoots have been imported into the United States since the beginning of the date industry. Dr. Coit says that all of the requisite conditions for the successful growing of dates may be found in many places throughout the Imperial, Coachella, and Colorado Valleys, and the country around Palo Verde and Blythe, Riverside County. The Imperial, Coachella, and Colorado Valleys are the regions in which date culture has proved its worth, and where are now to be found bearing orchards and thousands of newly-planted off-shoots. Dates are so far subject to pests only as imported on the young plants and subsequently scattered. This infestation is in the form of scale of two distinct varieties—the Marlatt and Parlatoria. A spray has been found that will kill these scales, thus eliminating all future danger from outside infection and making possible its eradication. Spraying and burning with a gasoline torch have proved to be an effective means of destroying scale on old and established palms.

THE SOIL IN WHICH IT GROWS.

The date is not particular as to the soil in which it grows, and will thrive in considerable alkali. Light and heavy soil alike seem to produce dates. While the date is a desert palm and requires a long period of intense heat for proper development and ripening, the roots require an abundance of water. Dr. Coit says that one miner's inch of continual flow is sufficient to maintain a five-acre orchard of bearing dates.

PLANTING DISTANCE.

The off-shoots are set 25 feet by 30 feet apart, or about 60 trees to the acre, and begin to bear at the ages of from three to five years. Seedlings are somewhat uncertain, but off-shoots always come true to the parent. A conservative estimate of the bearing capacity of a ten-year-old tree would be 100 pounds. Some will bear as high as 400 pounds to the tree. A leading Los Angeles grocer has placed the retail price for fresh California dates at from 50c to 75c a pound. They bring from 15c to as much as $1 a pound to the grower. Fruit matures here from September through December, some varieties ripening on the trees, others requiring artificial heat. The Degle Noor is very popular among growers at present, as it will ripen on the tree before the cold weather comes, and is of unusul delicacy of flavour.

BEARING CAPACITIES.

A palm reaches its maximum bearing capacity at ten years and will continue to produce for one hundred. One palm sometimes bears as high as twenty bunches in a season. Off-shoots are produced between the ages of three and fifteen years, after which no more appear. During this period, one palm will produce ten or twelve off-shoots, sometimes more. The importer's price for off-shoots is $8 apiece; those grown locally cannot be had for that.

Palm Springs can boast of a few young date palms that have come into bearing, but has nothing on a commercial scale, nor any palms of great age.

At India is located one of the government experimental stations where date culture is being forwarded. On an adjacent ranch are four Deglet Noor trees that produced 300 pounds last year that sold for $1 per pound on the average. Twelve imported trees on the same ranch will produce this season, at the age of seven years, about 750 pounds of fruit, as they are now laden with 75 bunches of dates. An offer of $25 apiece for off-shoots from these Deglet Noor trees was refused, as the owner wished to set more plants, and considered them worth that much to himself.

DATE GARDENS.

At Mecca is the largest experimental date garden in the valley. These trees are growing on soil containing three-tenths of one per cent. alkali and have been fertilized regularly each year, with one yard of manure to a tree; and have received frequent and abundant irrigation, with prompt cultivation after each watering. The trees have been sprayed for scale. All of the old palms are heavily laden with fruit and are in splendid condition.

Situated a few miles southwest of Mecca is an orchard containing 5,000 date palms. Of these between 300 and 400 are of bearing age, running from three to five years. The crop on them is estimated at 2,000 pounds and should average 75c a pound. From one three-year-old Deglet Noor tree the owner took 90 pounds of fruit. When four years old, this tree produced no fruit. This season, at the age of five, the crop is estimated at 250 pounds, of which 150 pounds are engaged at $1·50 a pound. In addition, the palm has already produced three off-shoots. This grower expects to net from $300 to $600 an acre from his dates when they have become ten years of age. These trees are growing in soil that contains from one to six-tenths per cent. of alkali, and some salt. They are fertilized with manure once a year, and trees producing fruit are fertilized with potash, phosphates, and cotton seed. Several other ranches in this vicinity have trees producing excellent fruit.

The Imperial Valley is sprinkled with date plantings and has several experimental farms where dates are grown. The trees thrive and fruit here very readily, as the date is well adapted to such climatic conditions as exist here.

One of the Arizona experimental farms is situated at Yuma, where seven-year-old dates may be seen in full bearing. These trees have never been fertilized. Cultivated crops have been grown between the rows, through which the dates have received their only tillage. In the spring of 1912, the

palms were pruned severely and burned with a gasoline torch, to kill the scale. After this harsh treatment, one seven-year old palm, that already had eight off-shoots, produced ten bunches of fruit. Some palms did not bear at all.

Thrifty fruiting palms are also to be found on the mesa near Yuma. These have had little care but the water necessary to keep them growing. One nine year palm produced, in 1911, 210 pounds of fruit that sold for 10c per pound, f. o. b. Yuma.

THE DATE INDUSTRY.

The date industry seems to be a coming thing for these valleys, and while the results so far obtained are largely problematic, there seems to be no reason why the future shall not witness great commercial success of date culture. The seedlings are uncertain as to sex, quality of fruit and age of bearing, but by proper selection and propagation from off-shoots, standard varieties can soon be produced in abundance. Scale is under control, and the climatic conditions are proved. Time will do the rest.

SOUTH INDIAN CATTLE.

Mr. Sampson, Deputy Director of Agriculture, Madras, lecturing recently on this subject, referred to the various breeds existing in the South.

The Ongole type is met with in the N. Circars and deteriorates from Ongole towards the north and towards the south. An important subtype known as the *Dupad cattle* which was nearly extinguished in the famine of 1868 is met with east of Kurnool and is apparently a cross between the Lambadis and Ongoles. The second type consists of the *Hill or Plateau cattle* met with in the Mysore plateau and in its slopes all round, e.g., in Kollegal, North Salem, North Arcot and the Ceded Districts. The third type is made up of the *improved country cattle*, apparently a cross between the Kangayams and the country animals, met with in S. Chingleput, S. Arcot; Trichinopoly, Salem, Tanjore and N. Madura, these being hardy animals thriving on minimum feeding. In addition to these types, there are several other types met with in various parts of the Presidency, for instance, the Mysore Cattle, the cattle found in the Yerramalais, those found in the forests of Cuddappah and those met with in the Cumbum valley below the Palni hills.

Mr. Sampson, in detailing the experiences of his tour on the cattle survey of Southern India, on which special duty he was engaged in 1911—12, expressed his opinion that there was now a general tendency amongst cultivators to keep better cattle and adduced 2 chief reasons for this. The first one was the increase in the price of cattle which had doubled itself within the last 5 years, better cattle fetching even higher prices and mhote cattle now costing nearly thrice as much as formerly. The second reason given was the curtailment of grazing due to the increase in the area of

cultivation necessitating a better feeding which was more costly with the increased price of cattle food. He also noticed, he said, almost in every district, even in Tanjore, cases of individual ryots attending to better cattle-rearing which was usually done by purchasing young calves and feeding them well.

Mr. Sampson next pointed out the reasons for better types of animals being met with in Ongole, Mysore and Kangayam, and these were the *attention to grazing* and the *maintenance of good breeding bulls.* In Ongole grazing is to be had in temporary pastures and the animals have more of handfeeding and do not generally possess the same stamina as the Kangayams. Good breeding bulls are kept, but these are not available for sale, being Brahmani bulls. In the Mysore plateau, bulls are purchased at 2 years for breeding purposes, saleable at 7 years. Although there is not much grass during the hot weather, there is very good pasture in the monsoon in the forests which are not, after all, very thick, the main variety of grass growing being what is commonly called spear grass, which, in a young stage, forms probably the best pasture. In Kangayam, breeding bulls are not Brahmani bulls, but are the private property of the Pattagar. Grazing land is best in Kangayam, patta land being fenced, sown with grass and kept for 7 to 10 years and sometimes 20 years under pasture.

For the improvement of live stock, Mr. Sampson said that it was absolutely necessary to have good breeding bulls and animals should be gradually *graded up.* He instanced the case of a short horn breeding bull which fetched a price of £1,000. He also cited examples of grading followed in some tracts of the Presidency. For instance, the Dupad Lambadi cattle have been graded up by the Ongoles, the Vizagapatam cattle by Ongole bulls maintained in the proprietory estates and the Kangayam animals by the Baragurs from Kollegal in former times and by the Ongoles in recent times. A general improvement was noticeable in the size of the Kangayams as a result of the grading. He recommended that country cattle should be graded up by bulls of suitable size and that poor putta lands might be put down by owners to temporary pasture.

With regard to the cows, Mr. Sampson was of opinion that there were no milch cows proper in Southern India, beyond the Nellores.

In the discussion which ensued, Mr. J. Chelvaranga Raju (Assistant to the Principal) said that the Pattagar graded up his breed with the Alambadis or Baragurs with the double object of infusing spirit into the animal and of increasing the milking capacity, but that the smaller ryots around Kangayam did not care to use the Pattagar's bulls for service. He also thought that, with the increasing mania for industrial crops like groundnut and Cambodia cotton, it would be difficult to induce cultivators to put down lands, however poor, to pasture, temporary or permanent.

Mr. S. L. D. Silva (Veterinary Assistant) mentioned that the local cattle around Kangayam were not much changed and were smaller animals with a fairly good milking capacity but that the Pattagar's animals were bigger and constantly changing.

The President (Principal, Coimbatore College) corroborated the statement of Mr. Sampson with regard to the absence of milking capacity proper in South Indian cows. He gave his experiences on the Central Farm on the subject of grading up and said that, although country cows of all sizes were kept on the Farm, their progeny, born to the breeding bull, Mappillai, which has, what may be called prepotency characteristics, were remarkably similar to the sire. With reference to grazing, he considered that the fencing of pastures was necessary and suggested that different pastures might be maintained by different ryots under hedges and the joint cattle driven, say, first week into one tract, second week into another and so on, allowing time and facilities for the grass to grow. The area of grazing need not be large. More than 130 animals were maintained on the Farm on a pasture area of less than 50 acres. The chief point was to give the animals some exercise and a bite of fresh grass. He closed the proceedings with a hearty vote of thanks to Mr. Sampson for his interesting lecture.

A NEW WEED EXTERMINATOR.

Wild garlic (*Allium vinale*) has for many years been a serious pest in that belt of territory which extends from Maryland to Missouri. Besides having the usual competitive action of a perennating weed, the plant is harmful in that the bulbils on the stem frequently get intermixed with wheat grain and create an objectionable flavour in the flour. As a weed with fodder crops, this plant may have an effect in causing the tainting of milk.

Considerable attention, therefore, has been directed by the Botanical Department of the Indian Experiment Station, towards methods for eradicating this noxious weed. A letter in *Science*, for January 3, 1913, states that remarkable results have been obtained by the use of orchard-heating oil as supplied by the Standard Oil Company. It was found that when the oil was distributed over the field in a fine spray by a sufficiently powerful spraying machine, practically all vegetation was killed, not only above ground but below ground as well. It destroyed the bulbs of the wild garlic below ground and the bulbils at the top of the stalks. One or two plants with very large horizontal rootstocks survived, since these required a rather large dose of oil than was generally applied.

The application of the oil appeared to have no lasting effects on the soil; the new growth from seeds already present in the soil and from subsequently sown cereals possessed the usual vigour.

In considering the trial of this method in the West Indies for exterminating perennial weeds like Devil's grass (*Cynodon dactylon*) and Nut grass (*Cyperus* sp.) the following questions arise: (1) Will the oil actually kill the hardy rhizomes and tubers of these weeds? (2) Does the oil possess any injurious effect regarding the physical and biological characters of the soil? and (3) What would be the cost per acre?—THE AGRICULTURAL NEWS.

SOYA BEANS.

Messrs. E. J. Woodhouse and C. Somers Taylor, Economic Botanist and Agricultural Chemist respectively to the Government of Bihar and Orissa have written an interesting paper to the *Memoirs of the Department of Agriculture in India* on the varieties of soya beans found in Bengal, Bihar and Orissa and their commercial possibilities. Some trials of the value of soya beans as a green vegetable carried out by Mr. Sil at Sabour showed that the pods were unpleasantly fibrous.

Oil :—The chief use of the oil is for soap-making, and it is for the extraction of the oil for this purpose that the seeds are being imported into England on a large scale. In China the oil is used as an illuminant, as a substitute for lard in cooking, though it is inferior to rapeseed and sesamum oil for this purpose, as a lubricant for greasing cart axles, and for water-proofing cloth.

Cake and Flour :—The flour is already utilized for the manufacture of biscuits and should prove a valuable food-stuff as it contains a high percentage of nitrogen. The bean cake has given results equal to decorticated cotton cake in a number of feeding trials with milch cows.

GENERAL CONCLUSIONS.

At the present time soya beans are grown to a slight extent only in the Darjeeling hills and to no appreciable extent elsewhere although satisfactory yields have been obtained in the experiments conducted by the Agricultural Department in both these areas. We may ascribe the present unpopularity of the crop to the following reasons. For export the price offered in Calcutta is not yet sufficiently attractive ; as a food-stuff it is more potent than the ordinary pulses to which the people are accustomed ; as a crop for growth in the plains it has the disadvantage of occupying the land during two seasons, it may suffer from water-logging during the rains and requires plenty of moisture in October, and it harbours rats during the last two months of its growth. These objections do not appear to us by any means unsurmountable. We have already shown that there are good prospects of an increase of price of soya bean meal, which should enable manufacturers to pay more for their raw material. The use of soya beans for food could be extended if the educated classes once appreciate its value as an addition to a rice diet, and experiment with its preparation for food on the lines suggested. As a field crop in the plains it can suitably replace *Urd* or *Kalai* (Phaseolus Mungo, Linn) as a mixed crop with Maize, in which case the maize would be harvested in September and the soya beans in December. It could also take the place of the *Kulthi* (Dolichos biflorus) and sometimes *Kalai*, which are sown on large areas of high lands in September and which do not give very heavy or profitable crops. Its cultivation in the hills would probably be largely extended on the present lines as soon as the price reached a satisfactory figure. It only remains to say that our work is being continued on the lines indicated in this paper with a view to isolating early maturing types possessing a high yield of oil.

CROPS AND MANURES.

The dry weather which prevailed so long, even in some districts having usually plenty of rain, has made many of such planters now turn their ear to the idea of mulching. These tussles with Nature such as we are having,—too much rain, too much dry, soils not yielding so well, are doing good work. Things are not being left to chance so much. There is more attention paid to the kind of seed or plants to be planted, to the preparation of the soil, to its cultivation, and to the handling of the produce. But as far as appreciation of the need of the soil to be manured to make up for the tremendous amount of products we export annually, there is little comprehension of this. But we wish readers to reflect for a little on the following. Take an acre of any crop, say an acre of bananas, about 300 bunches averaging about 50 lb. weight will be taken during every 15 months and shipped away, i. e. 15,000 lb. Where has this weight come from, A large part of it is water, as bananas contain about 75 per cent. of water, but the rest has come from the soil. And that has been going on for 20 years. But bananas are not deep feeders, and so take what they need from the topmost foot or so. While deep cultivation may keep them going for a few years as good as ever, manure is soon necessary. Deep rooted trees like Mangoes can get their wants supplied all the way down to 20 feet. Over 14 millions of bunches of bananas have been shipped from Jamaica each year lately, so we can see the amount of fertility that is taken away. And 15 millions of coconuts, 75 thousand hundredweight of coffee, 50 thousand hundredweight of cocoa. Sugar does not take away much from the soil, and sugar planters have mostly been wise "from time," saved their trash, penned their cattle, and some of them have grown Cowpeas; but at any rate they were always adding the trash and dung from the cattle to their fields. How many banana planters have been in the habit of penning their mules and cattle to add manure to their fields? But they will do it yet, just as they have started growing Cowpeas, overlook Beans, Jerusalem Peas, etc. And they will also use fertilisers on these to give them a greater and deep growth.

Our local crops are sore on the soil, sweet potatoes especially, as all their feeding is done in the surface soil. But local crops are consumed here, and if only all the waste, the excreta, human as well as animal, were carefully saved and used as manure, there would not be the tremendous loss of fertility that has been taking place. But in spite of the great amount of stuff we have exported, there is still in some soils a great amount of fertility, especially the stiff soils, hard to work. This fertility is, as it were, locked up, and while manure would be of advantage, it would only be so if the soil was broken up fine; it would be of no use putting a load of manure on the top of hard soil, stiff below. The virtue of it would mostly be washed out by the rain instead of being mixed with the soil. So hand in hand with manuring, there must be the breaking up of the soil, in order that the plant roots may be able to get the manure and use it.—THE JAMAICA AGRICULTURAL SOCIETY JOURNAL.

FRUIT GROWING IN AUSTRALIA.

Mr. S. A. Cock, Orchard Supervisor, Bendigo, contributes an article to the *Journal of Agriculture*, Victoria, on the subject of Citrus Culture in Victoria.

Fruit-growing in Victoria, he states, is rapidly becoming one of the most important industries in the State. The area under cultivation is extending every year with fruits suitable to their geographical situation, and in the northern areas, under irrigated closer settlement, Citrus culture is making such progress that it bids fair ultimately to outstrip all other classes of fruit in area and production. For the benefit of those who are embarking on the production of oranges and lemons this article will deal with Citrus culture in all its aspects. According to soils, situations, stock, varieties, planting and pruning, irrigation, cultivation, drainage, manuring, picking, packing, marketing and diseases.

SOILS.

The suitability of the soil is a most important feature in connection with the successful cultivation of the Citrus family. Perfect drainage is an absolute

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essential. Careful consideration is, therefore, necessary in the selection of a soil for the successful growth of Citrus trees. Generally speaking, a suitable soil for Citrus culture should be a deep loamy soil, overlying a porous subsoil, which in turn overlies a gravelly wash. Red soils, as far as my experience goes, do not make any difference in the deeper red colour of the rind.

Tests of the subsoil of any area to be planted should always be made before planting, so as thoroughly to understand its character, quality, regularity, and freedom from any hardpan or impervious layers of cement. Its porosity can be determined by digging a hole 4 feet square and 2 feet deep, under absolutely dry conditions in the summer months, January or February. The hole should then be filled to the surface level with water, and in two days this water should have thoroughly drained away naturally, if it does not do this, the soil requires under-drainage.

SITUATION.

The aspect of the orchard should be well considered. Citrus trees like a well sheltered and warm situation. The generally flat surfaces of the suitable areas do not lend themselves to much choice, but advantage should always be taken of any eminence. The orchard should be given, as near as possible, a northerly and an easterly aspect, and should be protected from the south and west. The climatic conditions of the north and east are congenial. The cold winds of the south and the west are very severe on young trees, as well as on the young growths of old trees. On the plains of the north frosts are rarely severe enough to do any serious damage. Any fall of temperature below 29 degrees Fah. may injure the lemon, but the orange will stand more severe conditions of frost. Only on rare occasions have very low temperatures occurred, as can be shown by the following table Taking the three places named as typical of the climate of the Citrus areas:—

Place.	Temperatures for 1910.		Greatest High & Low known.	
	Highest Maximum.	Lowest Minimum.	Highest Maximum.	Lowest Minimum.
Mildura ..	108° Dec 29	30° July 21	123°	23°
Bendigo ...	105° Jan 26	32.8° June 4	117°	21°
Echuca ...	109° Jan 26	32.6° July 21	115°	23°

In the midlands and the south, although every advantage is taken of soil and situation, the orange produces a fruit of thick rough rind, with much

rag, and of poor quality. The lemon does much better, and can be grown, practically, all over the State under congenial soil conditions—Doncaster and some parts of Gippsland being especially favourable. The suitable irrigable areas of the north successfully produce all classes of Citrus fruits.

Under irrigation, and on Closer Settlement blocks, mixed culture is the general practice. Blocks are as a rule small, and the holder has to produce many varieties of produce-lucerne, fodder crops, vegetables and fruit. Wherever practicable, suitable areas should be given over wholly to the production of special crops. There should be Citrus areas, deciduous fruit areas, and vine areas, distinct from lucerne areas, and mixed fodder crops. This would modify, to a large extent, the danger of over-irrigation, and under seepage, so injurious to Citrus trees, caused by the laying out of closer settlement blocks on wrong lines. Under intense culture, Citrus trees should be planted on the highest portion of the land. The highest portion is usually the sandiest and best drained, and along the highest points the irrigation channels are brought to command the block.

Citrus trees require more frequent irrigation than deciduous fruit trees or vines and, economically, the planting of the highest land with Citrus follows as a natural deduction. Lucerne requires more water than fruit trees and if planted on the high ground, and the fruit trees planted adjacent to and below the lucerne, under-seepage is likely to occur with great damage to the orchard block. The older irrigators of this State will have recognised these conditions long ago.

To shelter the orchard from the south and west it is advisable to aid the situation by suitable wind breaks. Sugar Gums and Pepper trees planted, alternately, at a distance of 20 feet apart will make a suitable breakwind as far as shelter is concerned. The Sugar Gum grows high, and the Pepper tree has foliage right to the ground. These trees should never be planted nearer the orchard than 50 feet. Tagasaste (Tree Lucerne) is most suitable, and can be planted half a chain away from the orchard. It is a quick grower, long lived, makes a dense hedge, and can be trimmed, nor is it a robber of the soil. These trees should be planted in the early spring (August), at a distance of 8 feet apart. Olives can also be used as a breakwind. They do not grow rapidly, but form a valuable adjunct to the orchard, and should be planted 30 feet apart, half a chain away from the orchard. Varieties suitable—Black Italian, Blanquet, Bouquettier, Verdale, Lucca, Manzanillo, Hardy's Seedling No. 1. Cork Oaks (Quercus Suber) could also be used, planted 30 feet apart, and half a chain away from the orchard. They are evergreen, and should eventually be of commercial value for the cork they produce.

LUCERNE HAY.

When lucerne is carelessly handled in hay-making there may be considerable loss in weight, and still more in actual feeding value. In *Bulletin 35*, Colorado Experiment Station it is stated that in average lucerne from 40 to 60 per cent. of the crop consists of stems, the balance being leaves. As the hay dries the leaves become brittle, and, together with the finer stems, are easily broken off in the process of hay-making. It is calculated that in Colorado the loss from this cause ranges from 15 to 66 per cent. of the total crop by weight. These leaves are the most nutritive part of the crop. In his standard work on "Farm Foods," Wolf states that in clover the leaves contain more than half the flesh-formers of the whole crop. A similar estimate may safely be assumed for lucerne, and the importance of saving the leaves during haying is thereby emphasized. In making lucerne hay, the crop as left by the mower should be drawn into wind-rows before it reaches the brittle stage, and allowed to dry still more in that position until it is ready for carting. In rows the material will be sufficiently compact to hold most of the leaves when ready to lift, and, moreover, this kind of drying will preserve the colour better. Where a crop has been left too long in the swathe of an afternoon a dewy morning next day will often allow it to be raked together with little loss. On dry bristling lucerne the horse-rake is a bad implement,—and it is worst naturally when the crop is light.—JOURNAL OF AGRICULTURE, VICTORIA.

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TAPIOCA FLOUR AND STARCH.

We have published articles from time to time about certain commercial aspects of cassava; and it is known that in parts of India recent years have witnessed a systematic attempt to popularise it as a food. The roots of the cassava plant are the source of the various kinds of tapioca which come into commerce, chiefly from Malaysia. These roots form a popular native foodstuff in many parts of the tropics, and are consequently grown on a large scale. They contain a large quantity of starch, and apart from their use on a very extensive scale for the preparation of the starchy foodstuff tapioca, they have been used in the United States and elsewhere as a source of starch for manufacturing purposes. The Report published in the current issue of the *Bulletin of the Imperial Institute* on certain samples of "cassava starch" received from Sierra Leone, the Gold Coast, and Natal, in addition to a product known as "garri" from Southern Nigeria (which consists of dry, grated, peeled cassava roots), will be read with interest in that connection.

The sample of native-prepared starch from Sierra Leone was found to be white, free from dirt and foreign matter, possessing a faint, pleasant aroma, and devoid of any definite taste. It was submitted to a firm of brokers in London, who stated that it represented a medium quality of starch of the nominal value of £12 per ton, *ex* warehouse, the prices of cassava starch ranging from £9 to £14 per ton according to quality.

The sample from the Gold Coast was of good, white colour and entirely free from dirt and other extraneous matter. The material was rather damp when received. It was analysed with the following results :—

	Per cent.
Moisture	21·68
Ash	0·06
Starch	77·68

The cassava starch was submitted to commercial experts, who reported on it as follows :—

One firm stated that as regards appearance and purity this sample was one of the best they had seen, and they valued it at about £14 to £15 per ton, *ex* wharf, Liverpool. They added, however, that the demand for the product is not large, and that although it is suitable for use in certain textile industries, textile manufacturers will not readily change from the use of maize and rice starches.

Another firm considered that it should be possible to sell a large quantity of the product in the United Kingdom if it could compete with tapioca flour selling at £12 to £15 per ton.

The sample of cassava starch from Natal consisted of small granular pieces, with some powder. The starch was white, free from visible impurity, and apparently well prepared. It had, however, a slightly sour odour and

taste, due possibly to fermentation during drying, which would lower its commercial value. The starch was analysed with the following results :—

	Per cent.
Ash	0·09
Moisture	13·84
Starch	86·07

These figures show that the sample was of satisfactory composition.

In connection with an enquiry carried out in 1909 at the Imperial Institute regarding cassava starch from Fiji, specimens were submitted to experts in various branches of the industry, to determine its value as a substitute for the better-known starches in common use. It was found to be unsuitable for laundry purposes, but quite suitable for glucose manufacture. For the latter purpose it would have to compete with low-grade sago and tapioca flours, and with maize, and would be worth not more than £8 per ton in England. Experts stated that cassava starch would not be a good substitute for potato starch as a size for cotton yarn, but that it could probably be used in place of sago. A firm of brokers stated that there was at one time a good demand for cassava starch in Manchester and Liverpool at £14 to £15 per ton for general manufacturing purposes, and they were of opinion that well-prepared cassava starch would fetch about that price if placed on the market. This Natal product, if dried rapidly to avoid the slight sourness which characterised this sample, would fetch the best prices obtainable for cassava starch.

The sample of "garri" (Dried and Grated Cassava) from Southern Nigeria, consisted of small irregular granules of hard, yellowish, starchy material, showing a semi-translucent fracture. The product was free from any characteristic odour, but possessed a slightly sour taste.

It was analysed with the following results :—

	Per cent.
Moisture	11·4
Crude proteins	2·1
Fat	1·1
Starch, &c.	82·1
Fibre	1·8
Ash	1·6

Commercial experts stated that for food purposes the material would be difficult to sell in the United Kingdom in its present form, and they suggested that it would be perferable to prepare cassava flour or tapioca from the roots, as is done in this country. They valued the dried and grated cassava at 6*s.* to 6*s.* 6*d.* per cwt. for manufacturing purposes.

Manufacturers using starch for the preparation of glucose to be used in brewing stated that this granulated cassava might be worth £7 7*s.* 6*d.* per ton for their purpose, but that it will be difficult to sell at that price in competition with Indian sago flour. The latter is obtainable at £7 7*s.* 6*d.* to £7 10*s.* per ton, and, though slightly poorer in starch than this cassava product, it presents several advantages from the glucose manufacturer's point of view.—THE INDIAN TRADE JOURNAL.

BAOBAB OIL.

The Baobab Tree *(Adamsonia digitata)*—one of the Malvaceæ—is notable for the gigantic proportions to which it attains. In Madagascar it ordinarily reaches a height of 40 or 50 ft. with an average girth of 20 to 23 ft., but these dimensions are frequently surpassed.

In the Island of Mannar where the Baobab is found there are some huge specimens, one of which, according to Trimen, has a girth of 61 ft. 9 in. The fruit, which is edible, is sometimes called "Judas' Bag" on the supposition that it contains 30 seeds.

There are three known varieties of the tree, one of which ("rainiala") bears oblong fruit which when ripe are covered with fine yellowish brown down. This is the variety found in Ceylon, supposed to have been introduced by the Arabs.

To obtain the oil the nuts or seeds are crushed and then boiled in water.

The following averages have been worked out regarding the rainiala variety—number of fruits per tree, 80; weight per fruit, 10 oz.; number of seeds per fruit, 95; weight of seeds in 100 fruits, 22 lbs.; quantity of oil per 100 lbs. of seeds 1 gallon.

The seed is non-poisonous so that the cake may be used as cattle food. The oil is yellow in colour, with a pleasant odour. It solidifies at 13°C and is rich in fatty acids, remaining firm at normal temperatures. It is considered suitable for the making of artificial butters, pharmaceutical preparations, soaps, &c. (*See frontispiece.*)

THE ENTOMOLOGICAL RESEARCH COMMITTEE.

The work of this Committee deserves close attention and warm support from everyone who believes in a united Empire. Nominally, the Committee aims only at stimulating interest in the study of insects, especially noxious insects and at organizing collectors and observers to accumulate information. Actually, it is giving an admirable illustration both of Imperial co-operation and of scientific organisation; and the possibilities of development are immense, if only its precise work is understood and appreciated. Of course, in an old-settled land with a temperate climate economic entomology is relatively, though only relatively, unimportant; but it is a vital concern in tropical areas of virgin soil. It has been given us to govern large areas of this kind; and the extraordinary development of preventive medicine, as illustrated, e.g., by the reduction of the death-rate amongst European officials in British West Africa during the last fifteen years from 90 per 1,000 to only 14, practically guarantees that we can govern them without undue waste of human life.—UNITED EMPIRE.

A VILLAGE FAIR.

Village fairs are valuable agencies in providing facilities for the sale of Agricultural and Industrial products, the disposal of which would otherwise be a matter of difficulty. In populous centres such as Piliyandere in the Western, Beliatta in the Southern and Chunakam in the Northern Province, markets are held daily, but in outlying districts the fair is a weekly one and generally takes place on a Sunday, probably to meet the convenience of buyers. Such are the fairs held at Kirriwattuduwa in the Western, Udispattuwa and Harasbedda in the Central, and Bandarawela in Uva Province.

The fair held at Harasbedda is of the greatest importance to the people of Walapane where agriculture is still in a very backward state. The inhabitants are poor and the district unhealthy, so that the facilities offered for disposing of such produce as there is to sell is a great concern to them.

The produce consists of vegetables (of which the quantity and quality are capable of considerable improvement), poultry, eggs, Indian corn (which is grown on a comparatively large scale), beans and millets, and some fruit of an inferior description.

The opportunity for selling is, however, taken advantage of by peripatetic vendors to expose their wares (consisting of cheap cutlery, trinkets, &c.) at the same time and place, so that the result is a fairly large display of miscellaneous articles both useful and ornamental which draw together an immense concourse of people.

Harasbedda, situated about half-way between Ragala and Nildandahena, consists of a small clump of houses on a track across rolling downs flanked by high hills. The country is well-watered and suited for the rearing of cattle, sheep and goats.

Purchasers come from long distances for the Sunday fair, some all the way from Nuwara Eliya : but the large proportion of buyers are from the planting district of Uda Pussellawa.

The price of produce varies greatly according to season and also fluctuates with the in-rush or exodus of visitors who come upcountry during the hot weather in the plains.

The pity is that better arrangements are not made for the fair. There is a large permanent shed provided, but it is apparently not utilised except in wet weather. The usual practice is for the sales-people to deposit their wares in a jumble in the open, without any attempt at order or arrangement, which makes it not only difficult for purchasers to inspect the goods and make a proper selection but impedes their progress through the throng. The confusion is characteristic of the eastern market-place and though the result is very inconvenient to the visitor the general effect is most picturesque.

C. D.

VIEWS OF HARASBEDDA FAIR.

CASSAVA.

There are very large imports of dried cassava into the United Kingdom, large quantities coming from Singapore; but Malaya can grow cassava, apparently cheaper than we can, perhaps because it has largely been grown as a catch crop through rubber trees in large plantations.

Here are fresh quotations from England which will be of interest :—

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—JOURNAL OF THE JAMAICA AGRICULTURAL SOCIETY.

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ARROWROOT.

(MARANTA ARUNDINACEA.)

Mr. H. Powell has contributed the following interesting account on the cultivation and manufacture of Arrowroot to the *Agricultural Journal of British East Africa* :—

The world's supply of arrowroot is largely produced in the Island of St. Vincent, of the Windward Group, West Indies, where the writer of this article resided for a number of years and had special opportunities of becoming thoroughly acquainted with the various phases of the subject under review.

USES OF THE ARROWROOT PLANT.

St. Vincent arrowroot is derived from *Maranta arundinacea*, a plant with white flowers and broad green leaves, growing to a height of from two to three feet. It belongs to the natural order Marantacea.

The name "arrowroot" is said to have been derived from the fact that the native Indians used the roots as an application to wounds inflicted by poisoned arrows.

Arrowroot may be described as a pure kind of starch and is used for making puddings, gruel, biscuits, and for mixing with the cheaper brands of cocoa. It also forms a food for infants and invalids on account of the ease with which it is digested, and is favoured by the medical profession as an easy means of conveying nourishment of a stimulative nature.

CULTIVATION.

The land should be thoroughly ploughed or hoed, freed from roots, grass, etc., and the surface made fairly fine. Small holes or "chops," two or three inches deep and about eighteen inches apart, are then made with a hoe, and a piece of rhizome from the leaf-end is placed in each hole and covered lightly with soil. It is important to keep the land clean until the plants have grown to such a size as to be able to protect themselves.

DIGGING THE ROOTS.

When the leaves and stems have assumed a brown colour and a more or less prostrate condition, which occurs in about a year to fourteen months from the time of first planting, the "tubers," as they are termed, are dug with hoes. For this work a task of so many baskets is usually allotted to each labourer, the number of baskets varying with the weight of the crop and the tenacity of the soil.

RE-PLANTING.

When digging, the labourers throw the tubers into rows behind them and in the process of handling a piece of tuber is usually broken off and placed in the trench. Many of the smaller tubers are also left behind and thus no further planting is needed for the next crop which is ready for digging a year afterwards. Provided the soil is rich enough, the same land will produce a crop of good tubers several years in succession. As a rule, however, manure of some sort is applied after the second or third year, and the land allowed to lie fallow after the fifth or sixth year or earlier, as circumstances may determine.

WASHING THE TUBERS.

On removal from the field to the factory the tubers are thoroughly washed either by hand or in "washers" especially made for the purpose. This removes all soil, bits of sheath and rind which may adhere to the tuber.

FACTORY.

In the West Indies the factory is nearly always situated by the side of a river or mountain stream in order to ensure an abundant supply of water as the grinding mills are in nearly every case worked by water power. The mill, or grater, consists of a round block of hard wood, a foot or so in diameter, and perhaps eighteen inches wide, into the surface of which are firmly placed a number of thin steel plates with saw-like edges. This drum is made to revolve at a rapid rate, and the tubers are fed by a labourer who uses a piece of soft wood a foot or two in length and about three inches in diameter for pressing the tubers against the graters whilst all the time a copious jet of water is made to play on the roots. The pulpy mass is pressed through sieves of varying size, on to which a jet of clean water is constantly playing, and thus the fibrous material is separated from the starch.

SETTLING TABLE.

The starch laden water is conveyed by means of small wooden troughs on to the settling table which is made either of wood or concrete, about three feet high, and is from three to four feet wide, side strips from four to six inches high. The length is from 120 to 150 feet but is so constructed as to run in two or three parallel lengths with easy curves so as not to restrict the flow. This flow is so regulated that by the time the starch-water has reached the furthest end all the starch has settled on the table.

WASHING THE STARCH.

At the close of each day, when grinding operations have ceased the starch settled on the table is removed and placed in large, shallow tubs or vats to which pure filtered water is added and the whole stirred or churned up. This process is repeated two or three times. Afterwards the starch is left to settle into a dough-like mass before being transferred to the drying house.

DRYING HOUSE.

An open, airy situation is selected for this and as near to the factory as is found convenient. The size of the structure depends upon the amount of starch to be dealt with. It is usually made of lumber with a closely boarded and shingled or galvanised iron roof. The sides are made of lumber and wire netting with shutters opening outwards and canvas blinds for protecting the starch from too much sun or inclement weather. The drying trays are made of a rather close meshed wire netting. These are placed, half a dozen or more, one above the other in the centre and on the sides of the interior of the house. The bottom tray is made of wood, is of a large size and is deeper than the upper ones. As soon as the blocks or lumps of starch on the wire netting trays are sufficiently dry they are beaten or shaken, which causes the material to fall into the wooden trough at the bottom. In fine weather complete drying of the starch may take place in from three to six days.

PACKING OR BARRELLING.

For this purpose an ordinary sound and clean flour barrel is used, the inside being lined with blue paper which adds to the attractiveness of the pure white fine starch. The latter is beaten down so that a barrel holds upwards of 200 lbs. Finally, the top of the barrel is securely fixed, the Estate's mark and brand stencilled on, and the package is ready for export.

Arrowroot is also packed in tins of various sizes, canvas bags, paper packets, etc., to suit the requirements of local and foreign buyers.

YIELD.

Much depends on the nature and quality of the soil, rainfall etc., but usually the yield may be said to vary from 1,000 to 3,000 lbs. or more of dry starch per acre. The whole-sale price according to quality ranges at the present time from *2d.* to *4d.* per pound.

WHAT IS AN EXPERIMENT STATION.

There seems still to be some confusion in the minds of many as to the real functions of an experiment station. It is not uncommon to hear some of our friends criticizing the poorness of the crops which are to be seen growing on the Government Experiment Stations. Criticism is indeed essential to the well-being of a live Department of Agriculture. But it should always be constructive and based on a correct understanding of the purpose in view. Take, for example the humble mealie. It is easy enough for the manager of any experiment station to grow a good crop of Hickory King ; but if he carries out experiments with a new breed of maize from Mexico or Peru he may well expect the first year a feeble growth and a poor stand because the new variety has not yet become acclimatized. And the thoughtful ruralist who sees a puny plant will not jump to the conclusion that his own splendid ten-foot crop is necessarily the result of his superior skill in cultivation. The farmer has neither the time nor the money to conduct the elaborate experiments. That is a matter for the Government ; and if one crop is hastened by a liberal dose of fertilizers while another, close by, is eking out a miserable existence in a new and uncongenial climate, the intelligent farmer will neither over-estimate the merits of the one nor under-estimate the possibilities of the other. We well remember listening to an illuminating lecture on plant selection by Professor A. L. Woods, who is now Director of the College of Agriculture of the University of Minnesota. He had just returned from an agricultural tour in Russia ; and what surprised him most of all was to see here and there little patches of wheat which had been left to ripen in many of the fields. He inquired the reason and was told that these tiny patches of corn was all that had survived from the last season's drought.

An American farmer, Doctor Woods remarked, would in despair have ploughed under those few isolated patches ; but the patient Russian peasant carefully reaped the last ears of his damaged crop and it was this simple process of selection, unconsciously pursued over many years, that at length produced the wonderful drought-resistant durum wheat of Russia. In this

connection we may remark that Mr. Burtt-Davy, the Government Botanist, is making rapid progress with his maize breeding experiments at Groenkloof, Pretoria. He finds the situation there more convenient, and the soil much better for experimental work than the previous station at Skinners Court. It will interest our readers that he recently reaped ears of dead ripe maize in eighty-two days. This constitutes a record. A short time ago the thermometer fell to 37° F. at the Standerton Stud Farm. The value of a quick ripening mealie for late planting is a matter of great importance to our farmers on the high veld.—AGRIC. JOUR. OF THE UNION OF SOUTH AFRICA.

THE CASTOR OIL PLANT.

It is likely that this plant which is at present a weed may come to be worth cultivating in the Island both for the oil produced by the seed as well as the poonac or cake which is so largely used as manure chiefly in coconut cultivation.

The castor plant is a native of Africa, and is cultivated in India, Persia, Arabia, China and Japan: as well as in West Indies, Tropical Africa and America, and also in Italy.

The plant likes a peat soil and thrives best in alluvial areas.

There are annual and perennial varieties of the castor plant, the annual being much smaller. The perennial grows very fast and may reach 15 or 30 feet in a year. The colour of the foliage varies from pale green to red and purple. The stem is hollow the leaves large and lobed. Male and female flowers are born on the same tree, and the fruit is three-celled and contains three seeds. The seeds vary much in size and colour. They are oval and flat on one side, smooth and shiny and generally prettily marked, the colour varying from grey to yellow and brown.

Perennial varieties are suitable for growing along boundaries and once established last a considerable time.

In India area cultivated may be said to vary from 100,000 to 200,000 acres.

In the Bombay Presidency castor is grown with sorghum, groundnuts and other crops, and invariably found in vegetable gardens where it afford grateful shade besides being directly remunerative. The annual variety is frequently sown in rice fields together with a leguminous crop as soon as possible after the rice is removed. In this case the seeds are put a foot apart and about 10 lbs. are required per acre. Later on the seedlings may be thinned out to 2 or 3 feet apart. If there is a good supply of moisture the plants will be 4 to 5; if deficient 18" to 2'. A crop sown in October-November will ripe in February-March. The crop is harvested by cutting the bunches of fruit which are spread out to dry. The seed is separated by beating with a stick. The stems are used as fuel and cattle will eat the leaves.

The following may be taken as the average produce of an acre of castor grown after rice on fairly good soil in a favourable season: Seed 525 lbs., purified oil 20 lbs., oil-cake 286 lbs., waste 38 lbs.

Where castor is grown alone and receives special cultivation the yield of seed should not be less than 1000 lbs.

HEALTH IN THE TROPICS.

United Empire has a lengthy article on "Medical Science and the Tropics," being a paper read by Sir Ronald Ross, K. C. B., M. D., etc., before a meeting of the Royal Colonial Institute from which we take the following:—

One of the most interesting questions of history is, Why has not tropical Africa become civilised long ago? After all, Africa is near to Europe. Even in the times of the ancients there was a high civilisation in Egypt which, one would have thought, could easily have spread into Central Africa. There have been plenty of routes of communication, both across the desert and by sea down the west and east sides of the continent; and yet civilisation never took a hold, but was repulsed at every step. I cannot but feel, on comparing all the arguments, that this phenomenon was principally due to the great tropical diseases of Africa.

MALARIA.

But these diseases do not affect only immigrant Europeans, they are almost equally disastrous to the natives, and tend to keep down their numbers to such a low figure that the survivors can subsist only in a barbaric state. To believe this one has to see a village in Africa or India full of malaria, kala-azar, or sleeping sickness, or a town under the pestilence of cholera or plague. Nothing has been more carefully studied of recent years than the existence of malaria amongst indigenous populations. It often affects every one of the children, probably kills a large proportion of the new-born infants, and renders the survivors ill for years; only a partial immunity in adult life relieves them of the incessant sickness. Here in Europe nearly all our children suffer from certain diseases—measles, scarlatina, and so on. But these maladies are short and slight compared with the enduring infection of malaria. When I was studying malaria in Greece in 1906 I was struck with the impossibility of conceiving that the people who are now intensely inflicted with malaria could be like the ancient Greeks who did so much for the world; and I therefore suggested the hypothesis that malaria could only have entered Greece at about the time of the great Persian wars—a hypothesis which has been very carefully studied by Mr. W. H. S. Jones. One can scarcely imagine that the physically fine race and the magnificent athletes figured in Greek sculpture could ever have spent a malarious and spleno-megalous childhood. And conversely, it is difficult to imagine that many of the malarious natives in the tropics will ever rise to any great height of civilisation while that disease endures amongst them. I am aware that Africa has produced some magnificent races, such as those of the Zulus and the Masai, but I have heard that the countries inhabited by them are not nearly so disease-ridden as many of the larger tracts. At all events whatever may be the effect of a malarious childhood upon the physique of adult life, its effects on the mental development must certainly be very bad, while the disease always paralyses the material prosperity of the country where it exists in an intense form.

YELLOW FEVER, DYSENTERY, &c.

Consider now the effects of yellow fever, that great disease of tropical America. The Liverpool School sent four investigators to study it, and all these four were attacked within a short time. One died, one was extremely ill, and two suffered severely. The same thing tended to happen to all visitors in those countries. They were almost certain of being attacked by yellow fever, and the chances of death were one to four. Tropical America was therefore scarcely a suitable place for a picnic party! But malaria and yellow fever are only some of the more important tropical diseases. Perhaps the greatest enemy of all is dysentery, which in the old days massacred thousands of white men and millions of natives in India, America, and all hot countries, and rendered survivors ill for years. Malaria has always been the bane of Africa and India; the Bilharzia parasite, of Egypt; and we are acquainted with the ravages of kala-azar and sleeping sickness. Apart from these more general or fatal maladies, life tends to be rendered unhealthy by other parasites and by innumerable small maladies, such as dengue and sand-fly fever, filariasis, tropical skin diseases and other maladies, which, as I am not writing a treatise on tropical medicine, I will not discuss at the moment. True, we have many maladies in Europe, but in order to compare the two sets of diseases we should compare the death-rates. Whereas in England it is a long way below 20 per thousand per annum, throughout the tropics it is nearer 40 per thousand. In India alone malaria kills over a million persons a year, and dysentery and malaria kills many hundreds of thousands. I have seen places in which the ordinary death-rate remains at between 50 and 60 per thousand; others which were so unhealthy that they were being deserted by their inhabitants; and others, lastly, which were simply uninhabitable. What would people say if such a state of things were to exist in most villages in England, Scotland and Ireland. Yet I would emphasise the following point—that this death-rate does certainly not depend entirely upon the climatic factor. There is another factor besides the mere heat; and the proof of this is that there are many islands and areas in the tropics which, in spite of the heat, have as low a mortality as holds in Europe. I need mention only the Seychelles in the Indian Ocean, with a mortality which has been down to 14 per thousand, and some of the healthy West Indies. If some places in the tropics can be so healthy why should not many others be rendered equally so? There is another factor besides the climate, and it is the great merit of tropical medical science that it has now discovered that factor, and has shown the way to remove it.

THE PARASITOLOGISTS AND THEIR RESEARCHES.

Tropical medicine and bacteriology started from different origins. The seeds of tropical medicine were really contained in the works of parasitologists labouring in Italy and Germany during the last three centuries—often labouring entirely unknown to the public. Studying the larger parasites of man and animals they were gradually led to that remarkable law of Metaxeny, according to which many parasites are transferred from one individual to another by the agency of intermediary hosts. Our recent advance regarding the route of infection in the great tropical diseases has largely been merely an extension of this law. The whole history of the subject is a fascinating one to the man of science, though it has never yet been written. We see on the one hand the pioneer of these European workers, and on the other

hand the pioneer labours of hundreds of medical men serving in the tropics, who for some centuries described and differentiated the diseases which they were called upon to treat. Gradually the two streams of investigation coalesced, with the result that the diseases differentiated by the doctors were explained by the researches of the parasitologists. The culminating period of advance has lain within the last thirty years. Malaria has been shown to be due to a minute animal parasite which is conveyed from man to man by Anopheline mosquitos. Filariasis has been shown to be carried by another group of mosquitos; while yellow fever and dengue, though their actual cause has not yet been certainly ascertained, have been proved to be communicable by a third group of these insects. Sleeping sickness is caused by other species of parasites, and is carried by a species of tsetse-flies. Dysentery has been shown to be of two kinds—a bacillary and an amoebic dysentery. The group of relapsing fevers have been shown to be caused by a third group of parasites, and often to be carried by ticks. Bacillary causes of cholera, Mediterranean fever, and plague have been definitely ascertained, and the great discoveries have been made that the last is communicated by the rat flea, and that Mediterranean fever is communicated by goat's milk. Yet another group of parasites cause the deadly kala-azar of India, and the famous Aleppo boil of Persia. Every year sees fresh advances; but, still more, our methods of diagnosis have now been rendered so precise that many of these diseases are being found where previously they were not known to exist—for instance, kala-azar in Algeria and Italy, and Mediterranean fever in many parts of the world. At the same time invaluable discoveries have been made regarding non-parasitic diseases, such as beri-beri, which has been shown to be due to the absence of some chemical element which exists in the food, and which is essential to the nervous system; which lastly, numerous and patient researches are now being made as to the whole theory of immunity in these diseases and the best method of cure. Is not all this knowledge a great gift to the human race? Think for a moment of the value of the gift. It concerns the happiness, the prosperity, and the very life of every one living in the tropics—natives and strangers. It enables the medical man to be more exact and successful in his treatment, and, above all, it enables the sanitarian to be more exact and successful in the prevention of these terrible and widespread maladies. And this benefit is not bestowed merely for a day, but for as long as civilisation lasts.

Quite recently, the Liverpool School of Tropical Medicine sent a worker there, Dr. David Thomson, who writes to me from Ancon Hospital as follows :—

With regard to the sanitary work here, it simply consists in the straightforward carrying out of the principles which you have laid down—screening of houses, draining of ditches and streams, and dealing with large patches of water with larvicide and petroleum.....The work is carried on constantly and conscientiously all along the line of the Canal. The effect must have been marvellous, for mosquitos are exceptionally scarce. In Ancon here they are practically non-existent. I have not had a single mosquito bite since my arrival. Malaria in the American seems to be nearly a thing of the past, and according to the cases coming into hospital here, they must be scarce.

Mild cases only occur and they are nearly all cases of relapse due to insufficient quinine treatment.....With regard to the climate here it is in my opinion much less dangerous than the English winter, in that yellow fever and malaria are practically eradicated.

Another remarkable case is one in Mauritius. When I was there in 1908 there was terrible malaria in a large village and amongst the British troops living in barracks close at hand. The marsh that caused it was completely drained for about £2,000, and the result has been the complete extermination of the disease. Of this there is the clearest possible evidence because Major Fowler and I computed by direct methods the amount of malaria amongst the native children, and the repetition of this investigation last year has demonstrated the truth of what I have just stated. Lest it may be thought that the price of £2,000 was too great to pay for saving the lives of hundreds and the health of thousands of human beings, I may add that the invalidings amongst the British troops cost more than that sum during the few months that I was in the colony. Leaving malaria, I have to record the brilliant extermination of Mediterranean fever amongst the troops and sailors in Malta, and, I believe amongst peasantry in places in the South of France; and the reduction of sleeping sickness in Uganda. I could multiply instances of small campaigns by the score; but probably the most admirable result is that which has been obtained by the Colonial Office and the officials of West Africa in that country. I commend to the attention of those who are interested in the subject the White Paper Cd 6089 entitled "Vital Statistics of Non-native Officials: Returns for 1911." The total death-rate has fallen wonderfully from 1903 to 1911, while the invaliding rate may literally be said to have tumbled from the top of the page down to the bottom.

Seed and Plant Supplies.

The attention of members is invited to the circular-order for Seeds and Plants—for the next Planting Season:—Vide Advt. Page **2.**

MARKET RATES FOR TROPICAL PRODUCTS.

(From Lewis & Peat's Latest Monthly Prices Current.

	QUALITY.	QUOTATIONS.
ALOES, Socotrine cwt.	Fair to fine	45/6 a 55/
Zanzibar & Hepatic ,,	Common to good	40/ a 65/
ARROWROOT (Natal) lb.	Fair to fine	8d a 9d
BEES' WAX cwt.		
Zanzibar Yellow ,,	Slightly drossy to fair	£7 12/6 a £7 15/
East Indian, bleached ,,	Fair to good	£8 7/6 a £8 12/6
,, unbleached ,,	Dark to good genuine	£6 5/ a £6 15/
Madagascar ,,	Dark to good palish	£7 10/ a £8
CAMPHOR, Japan ,,	Refined	1/ 4½ a 1/6
China ,,	Fair average quality	155
CARDAMOMS, Tuticorin	Good to fine bold	5/2 a 5/8
	Middling lean	4/6 a 4/11
Malabar, Tellicherry	Good to fine bold	5/1 a 5/7
Calicut	Brownish	4/6 a 4/11
Mangalore ,,	Med Brown to good bold	4/9 a 6/3
Ceylon Mysore ,,	Small fair to fine plump	3/8 a 5/8
Malabar ,,	Fair to good	3/5 a 3/6
Seeds, E. I & Ceylon ,,	Fair to good	4/2 a 4/4
Ceylon Long Wild ,,	Shelly to good	1/2 a 3/2
CASTOR OIL, Calcutta ,,	Good 2nds	3⅝ d
CHILLIES, Zanzibar cwt.	Dull to fine bright	37/6 a 45/
Japan ,,	Fair bright small	28/ a 32/6
CINCHONA BARK.—lb.	Crown, Renewed	3¾ d a 7 d
Ceylon	Org. Stem	2d a 6d
	Red Org. Stem	1¾ d a 4¼d
	Renewed	3d a 5¼d
	Root	1⅞d a 4d
CINNAMON, Ceylon 1sts.	Good to fine quill	1/3 a 1/7
per lb. 2nds.	,, ,,	1/3 a 1/6
3rds.	,, ,,	1/1 a 1/5
4ths.	,, ,,	1/ a 1/3
Chips, &c.,	Fair to fine bold	2d a 4d
CLOVES, Penang lb.	Dull to fine bright pkd.	11d a 1/1
Amboyna ...	Dull to fine	10d a 10½d
Zanzibar ...	Fair and fine bright	8¾d a 10d
Madagascar ...	Fair	8¾d
Stems ...	Fair	2¾d
COFFEE		
Ceylon Plantation cwt.	Medium to bold	Nominal
Native	Good ordinary	Nominal
Liberian ,,	Fair to bold	77/a 84/
COCOA, Ceylon Plant, ,,	Special Marks	64/ a 90/6
	Red to good	81/ a 85/
Native Estate ,,	Ordinary to red	42/ a 73/6
Java and Celebes ,,	Small to good red	25s a 84s
COLOMBO ROOT ,,	Middling to good	12/ a 19/6
CROTON SEEDS, sift. cwt.	Dull to fair	45/ a 50/
CUBEBS ,, ,,	Ord. stalky to good	140/ a 170
GINGER, Bengal, rough ,,	Fair	30/ nom.
Calicut, Cut A ,,	Medium to fine bold	60/ a 75
B & C ,,	Small and medium	36/ a 60/
Cochin Rough ,,	Common to fine bold	28/ a 32/
	Small and D's	27/6
Japan ,,	Unsplit	23/
GUM AMMONIACUM ,,	Ord. Blocky to fair clean	40s a 72s 6d
ANIMI, Zanzibar	Pale and amber, ster. srts	£12 10/ a £14 5/
	,, ,, little red	£11 a £12
	Bean and Pea size ditto	70/ a £9
	Fair to good red sorts	£7 a £10
	Med and bold glassy sorts	£5 a £7 10/
Madagascar ,,	Fair to good palish	£4 a £8
	,, ,, red	£4 a £7
ARABIC E. I. & Aden ,,	Ordinary to good pale	28/ a 32/ nom
Turkey sorts ,,		30/ a 55/
Ghatti ,,	Sorts to fine pale	18/6 a 32/6nom
Kurrachee ,,	Reddish to good pale	25 a 30s nom
Madras ,,	Dark to fine pale	22/6 a 29/6nom
ASSAFŒTIDA ,,	Clean fr. to gd. almonds	£7 a £8
	com. stony to good block	40s a £5 12/6
KINO	Fair to fine bright	6d a 1/5
MYRRH, Aden sorts cwt.	Middling to good	50/ a 62/6
Somali ,,	,, ,,	42s 6d a 45s
OLIBANUM, drop ,,	Good to fine white	45s a 50s
	Middling to fair	35s a 40s
pickings ,,	Low to good pale	15/ a 27/6
siftings ,,	Slightly foul to fine	20s a 22s 6d
INDIA RUBBER lb.	Fine Para bis. & sheets	2/11½
	,, Ceara ,, ,,	2/9
Ceylon, Straits,	Crepe ordinary to fine	2/11 a 3/0¼
Malay St etc.	Fine Block	3/
	Scrap fair to fine	2/3 a 2/4
Assam	Plantation	2/6
	Fair 11 to ord. red No. 1.	2/1 a 2/3
Rangoon	,, ,, ,,	1/10 a 2/1

	QUALITY.	QUOTATIONS.
INDIARUBBER		
Borneo	Common to good	1/6 a 2/
Java	Good to fine red	1/11 a 2/3
Penang	Low white to prime red	1/ a 2/
Mozambique	Fair to fine red ball	2/6 a 2/10
	Sausage, fair to good	2/6 a 2/9
Nyassaland	Fair to fine ball	2/1 a 2/6
Madagascar	Fr to fine pinky & white	1/10 a 2/3
	Majunga & blk coated	1/4 a 1/7
	Niggers, low to good	6d a 1/6
New Guinea	Ordinary to fine ball	1/6 a 2/
INDIGO, E.I, Bengal	Shipping mid to gd violet	3s a 3s 6d
	Consuming mid. to gd.	2s 3d a 2s 10d
	Ordinary to middling	2s a 2s 2d
	Mid. to good Kurpah	1s 10d a 2s 5d
	Low to ordinary	1s 6d a 1s 9d
	Mid. to fine Madras	Non here
MACE, Bombay & Penang	Pale reddish to fine	2/6 a 2/8
per lb.	Ordinary to fair	2/2 a 2/4
Java	,, ,, good pale	2/4 a 2/8
Bombay	Wild	10d a 1.
NUTMEGS,— lb.		
Singapore & Penang ,,	64's 57 s	9½d a 10½d
	80's	7d
	110's	6½d
	160's to 115's	6d
NUTS, ARECA cwt.	Ordinary to fair fresh	17/6 a 20/
NUX VOMICA, Cochin	Ordinary to good	9/6 a 12/
per cwt. Bengal	,, ,,	8/9
Madras	,, ,,	8/6 a 9/6
OIL OF ANISEED ,,	Fair merchantable	6/10
CASSIA ,,	According to analysis	3/2 a 3/7
LEMONGRASS ,,	Good flavour & colour	3½d
NUTMEG ,,	Dingy to white	1½d a 1⅜d
CINNAMON ,,	Ordinary to fair sweet	2¾d a 1s 5d
CITRONELLA ,,	Bright & good flavour	1/9½
ORCHELLA WEED—cwt		10/ Nom.
Ceylon ,,	Fair	10/ ,,
Madagascar ,,	Fair	10/ ,,
Zanzibar ,,	Fair	10/ ,,
PEPPER—(Black) lb.		
Alleppy & Tellicherry	Fair	5⅜d a 5½d
Ceylon ,, ,,	Fair to fine bold heavy	5¼d a 5¾d
Singapore ...	Fair	5⅜d
Acheen & W. C. Penang	Dull to fine	5d a 5¼d
(White) Singapore ,,	Fair to fine	8½d a 9d
Siam ,,	Fair	8½d
Penang ,,	Fair	8¼d
Muntok ,,	Fair	9⅛d
RHUBARB, Shenzi ...	Ordinary to good	3/6 a 4/6
Canton ...	Ordinary to good	3/ a 4/
High Dried ...	Fair to fine flat	1/ a 1/2
	Dark to fair round	10d a 1/
SAGO, PEARL, large	Fair to fine	18/
medium ...	,, ,,	17/
small ...	,, ,,	13/6 a 15/6
Flour ...	Good pinky to white	11/ a 12/
SEEDLAC cwt.	Ordinary to gd. soluble	60/ a 70/
SENNA, Tinnevelly lb.	Good to fine bold green	4½d a 8½d
	Fair greenish	2½ a 4d
	Common specky & small	1d a 2¼d
SHELLS, M. o' PEARL—		
Egyptian cwt.	Small to bold	97/6 a £10 10/
Bombay ,,	,, ,,	70/ a £9 17/6
Mergui ,,	Chicken to bold	11 12/6 a 14 12/6
Manilla ,,	Fair to good	£8 12/6 a 14 12/6
Banda ,,	Sorts	50/ a 92/6
Green Snail ,,	Small to large	65/ a 95/
Japan Ear ,,	Trimmed selected small to bold	57/6 a £9
TAMARINDS, Calcutta...	Mid to fine bl'k not stony	9s a 11s
per cwt. Madras	Inferior to good	5/ a 9/
TORTOISESHELL—		
Zanzibar, & Bombay lb.	Sma llto bold	22/ a 36/
	Pickings	11/6 a 24/
TURMERIC, Bengal cwt.	Fair	17/
Madras ,,	Finger fair to fine bold	16/6 a 18/
Do. ,,	Bulbs ,, ,, bright	14/ a 15/
Cochin ,,	Finger fair	16/
	Bulbs ,,	14/
VANILLOES— lb.		
Mauritius ... 1sts.	Gd. crystallized 3½a 8½a in.	11/6 a 16/
Madagascar ... 2nds.	Foxy & reddish 3½a ,,	11/ a 12/6
Seychelles ... 3rds.	Lean and inferior ,,	11/ a 11/6
VERMILLION ...	Fine, pure bright	2/10
WAX, Japan, squares	Good white hard	44/

Engravers, H. W. Cave & Co. *Photo by C. Drieberg.*

The left bank of the Mahaweliganga opposite the Royal Botanic Gardens, Peradeniya.

Elevation 1,600 ft. above Sea level.